Electrical World

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Industry Becomes Drama at Dearborn

HISTORY has recorded no more dramatic coincidence than that presented on Monday by the association of Thomas Alva Edison and Henry Ford in the culminating celebration of "Light's Golden Jubilee." In all the ages of man's progression from the primitive no two contributions have so enriched humanity as electricity and the automobile. That these two revolutionary developments should have both come within the lifetime of men not yet old is striking; that each, now grown into a great world-serving industry, should be personified in the public mind by a single man, both living and in America, is amazing when one pauses to weigh the fact against the hazards of human affairs, and that these two men should be warm personal friends and one should play the host on an occasion of universal homage to the other, furnishes an element of romance seldom encountered in the world of industry. Therefore, it seems singularly appropriate that the impulse for this ceremonial should have sprung from such an idealistic conception and that its closing drama should have been enacted in so picturesque a setting.

Mr. Ford was inspired to this elaborate memorial to Mr. Edison for two reasons, one very human and personal, the other a lofty conception of abstract principle. Years ago, when Ford was still an engineer with the Detroit central station but already absorbed in his dream of a motor-driven self-propelling vehicle, he met Edison at a convention of the National Electric Light Association, talked with him about his plans and was encouraged by Mr. Edison to continue his experiments; and he has never forgotten. Above all, however, Edison stands in Ford's mind as the exponent of the heroism of persistent, courageous effort, bringing the advance of civilization by the patient application of the scientific method and with inspiration based on the most painstaking labor. He epitomizes the spirit of modern industry and the ideal from which springs the institute that Ford is founding in Dearborn, growing out of his industrial training school, with its unique museum of American inventive progress.

As Owen D. Young said in his eulogy of Edison at the banquet Monday night, the presence of so many distinguished leaders of our time in the early American village at Dearborn, where they gathered to join in celebrating the fiftieth anniversary of Mr. Edison's most important invention, taken in conjunction with the jubilee of light throughout the country, constitutes the greatest tribute ever paid to any living man. For though it was the lamp that symbolized the occasion, it was Edison the man that was exalted; and no one visited those historic buildings and contemplated the great benefactions that have enriched the world as the result of Edison's invention achieved so long ago within those walls but felt himself in the presence of a national shrine, a shrine which all the people of the world may well reverence. The perpetuation of this living museum of Edisonia is a priceless gift to the American people for which all electrical men should be very grateful.

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Future Depends on Encouraging "Impulses to Progress"

AT DEARBORN this week President Hoover said: "Our scientists and inventors are among our most priceless national possessions. . . . Research is one of the most potent impulses to progress." Sometimes we forget that values in life are measured in terms of an expanded leisure, enlarged interest, stretched vision and greater joy rather than money in the bank, and it is good for the nation to pause and pay tribute to science and invention so aptly epitomized in Thomas A. Edison. Mr. Edison has done more than accomplish material results of value; he stands for those unselfish dreams and aspirations whereby youth is inspired to remake the existing world. Therein lies the hope for progress.

The world goes forward over the corpses of dead ideas, yet it grants a very reluctant recognition to newly born knowledge. It took twenty years for Europe to learn that Columbus had discovered America. Modern industry must be alert to discard outgrown methods and should unhesitatingly administer lethal doses to speed their demise. Many first-class funerals are indicative of a healthy growth.

The world has come far in the short span of half a century—technically, corporately and sociologically—and it may safely anticipate amazing developments in the years to come. What will they be? In the electrical field, because of technical advances, all may be discarded that now is essential.

One thing alone is certain, and that is the continued

and largely augmented demand of humanity for other than human muscle and brawn to do more and more of the work of the world. There will be light in dark corners, cities as light by night as by day, and distances will be rendered inconceivably short by communication and transportation developments. It may be that energy will be instantly available to any one, anywhere and at any time. Even electrically propelled aircraft may fly back and forth or hover above the earth, and seasonal variations of temperature may be rendered free from discomfort indoors or out. All these things are more than probable. Undoubtedly they are inadequate to express the future.

To look forward in 1879 to the world of today was beyond the dreams of men, however full-visioned, and to try to foresee the world of tomorrow leaves the imagination gasping and weary. The electric light and power industry pauses at a significant milestone. Its future road must be built on "impulses to progress" such as Mr. Edison.

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Domestic Electric Wiring

SAFETY, adequacy and cost are the prime considerations in domestic electric wiring, and there are five parties interested in it—the owner, the contractor, the manufacturer, the electric service company and the municipal agency that represents the public interest. All five of these parties have an interest in the three prime considerations, but each one of them has a particular concern in one only of the three. The owner is concerned chiefly with cost; the contractor, manufacturer and central station think most about adequacy, and the municipality takes as its special province the matter of safety. Is it remarkable that confusion arises from such a situation?

Granted the difficulty of reconciling differences of opinion and the rapid evolution in the art, it would seem possible to treat the domestic wiring problem so that installations will be adequate to the present and future demands to be made on them and still keep intact the ideals of perfect safety and lowest cost. It is a matter of industry organization to perfect definitions and practices and then get them put into operation.

The past methods of attacking the problem have been as many and as various as the different minds of the individuals approaching it, and the National Electrical Code has been the only major vehicle of expression up to this time. This code is a wonderful example of coordination, considering the fact that it was developed under the auspices of an agency that has no primary interest in all aspects of the domestic wiring problem. But the code has provisions and omissions and interpretations that have a pronounced effect upon the adequacy of wiring. Despite the sincere and fruitful efforts of the Society for Electrical Development to mitigate through its uniform ordinance program the effects of these definitions and limits on adequacy, progress is slow. The domestic wiring problem will not be solved until all the parties in interest come to a common appreciation of the three prime considerations of safety, adequacy and cost. The present confusion is the result of each party giving too much weight to the one consideration that is its direct concern and according too little importance to the other two. Add to this the cumbersome industry organization for treating the problem and it becomes evident that the time is ripe for some new thinking and action on the situation. It is to be hoped that this thought and action will be taken as an industry rather than by individual industry groups.

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A Nation Salutes Its Benefactor

NEVER probably in the recorded history of the world has there been such a demonstration of organized felicitation as has greeted Thomas Alva Edison during the past week. Not only his own nation but almost the whole of the civilized world has rallied wholeheartedly at the suggestion that to this full-lived man there is due an expression of gratitude on the part of humanity.

There is little that may, in appreciation, be added to that which has gone before. Sincere tributes which took many forms have been expressed in every city, town and hamlet, from platform and in the public prints, on the radio and from billboards, in school and from pulpit, in verse and in prose. History has been called to witness, idealism has been stressed and enthusiasms have been exhausted. Edison has joined the heroes of the world.

On this great occasion the ELECTRICAL WORLD gladly joins in wishing Mr. Edison that full measure of happiness that is his desert and trusts there are in store for him many more years of hopeful, purposeful living in the "bright land of his imagining."

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Electrification of Steam Railroads

WHILE steam-railroad electrification is making headway in the United States, it is reasonable to suppose that had the electric light and power industry approached the problem more from a sales than an engineering angle, the United States would now have more miles of electrified railroad to its credit. Not that engineering can be ignored, for it is all-important; but there are considerations other than engineering to be taken into account, and some of these have been more effective in obtaining action than all the engineering arguments combined. As a matter of history, it is chiefly because of "the battle of the systems" indulged

in by the engineers of the manufacturing companies that greater progress in railroad electrification has not been made. That, fortunately, is now behind us, and the way is now open for calm consideration of the economic, civic and other factors entering into the problem.

Owing to the competition of the automobile, the autotruck and the bus, steam-railroad service and the efficiency of performance have been greatly improved. The means chosen, however, have been mechanical rather than electrical, and, because of the lack of familiarity of public utility executives and engineers with steam-railroad operation, it is still possible for railroad men to build up effective alibis against electrification. However, that will not be for long, for Britton I. Budd of Chicago, chairman of the N.E.L.A. committee on the electrification of steam railroads, is determined that the industry shall be informed on all the practical aspects of railroad electrification, and if the contact between the steam railroads and the utilities is not such as to appeal to every good business requirement, the fault will not be his.

As a preliminary to the work, a subcommittee, all of whose members are engineers, visited virtually every European electrification. The result of its work is embodied in a serial report just issued by the National Electric Light Association. Other subcommittees are at work on special problems, so that there are being accumulated and made available for the first time statistics and authoritative information of immense value to both the railroads and the utilities. Out of this should come understanding and as a corollary greater progress in railroad electrification.

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Cost Specialists Needed?

EXTENDED surveys of recent construction on utility systems indicate that a large field exists for the study of cost-reduction problems and that in not a few cases the personnel is insufficient to handle such matters effectively. In every branch of the power company's business, from the boiler plant to the end of the customer's service, countless opportunities can be found to weigh designs and methods from the investment standpoint. Now, it is plainly the duty of all concerned in such work to fight waste all along the line, and that this is being done widely needs no demonstration.

On some properties, however, the problems of cost engineering demand more time than many staff members are often able to give to them, or at least it is often hard to reap the results of more refined cost analyses in the pressure of daily work. Cost accountants can help in this work, but there would seem to be a need also for developing specialist service among engineers to secure the benefits of better-rounded study. The opportunities for co-operation are self-evident. Let some of the larger companies try concentrating cost analysis upon the shoulders of one or more qualified engineers as a specialty if they have not already done so. The results of such a plan will be well worth noting. Why not enlist more consultants in such work?

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Western Power Companies No Longer to Be "Made the Goat"

DECISION of power companies of the State of Washington not to wage an organized fight and spend large sums of money in an effort to defeat the "district power" bill, a state-ownership measure to be submitted to referendum next year, indicates a radical change in attitude by privately owned utilities toward public-ownership campaigns in that state. President A. W. Leonard of the Puget Sound Power & Light Company voiced the policy of the industry when he said recently:

> The power industry in this state is tired of bearing the brunt of continued political assault. It is tired of serving as a bumper to protect all other industries and businesses and the taxpayers generally from the attacks of those who are advocating public ownership of everything, regardless of costs and consequences. . . . We have no plans for any such organized resistance as was made to previous measures, which, like this initiative, were designed to put our industry out of business. We do not intend to let the politicians pose the industry as an object of public hostility. . . . If the properties of our own company should be taken, for example, we shall receive full compensation for them, whether purchased or condemned. As to this we can suffer no loss. . . . If the people want to wipe all this out [referring to expenditures and taxes of private utilities], they must reckon on paying the bill.

This is one of the most important changes in the attitude of private utilities toward public ownership ever made. There *is* no reason why light and power companies should be made to carry the brunt of government-ownership attacks and propaganda. Every privately owned utility of any kind whatsoever—be it water, gas, street railway, steam railroad, motor bus, telephone or telegraph—is in exactly the same boat as are the light and power companies. And it is just as logical, too, for those among the public who clamor for state development of the people's "God-given heritage," falling water, to apply the same reasoning to control of other natural resources, such as coal, oil, natural gas, timber and minerals. This would be so obviously socialistic that the radical element has not yet had the courage to propose it; none the less, government ownership of electric utilities would be the initial step toward public ownership of all utilities and a menace to private industry of all kinds.

The electric utilities of Washington State are perfectly justified in their refusal to shoulder the burden of defeating the initiative power bill next year. It is high time for other interests next in line for attack to show a little concern and for the public to do some thinking on its own account, and it should be a source of gratification that the light and power companies of the Pacific Northwest have taken this stand.

Courtesy Fotogram

World Pays Homage to Thomas A. Edison

Wizard of Menlo Park Re-enacts Birth of Incandescent Lamp Amidst Surrounding of 1879 Re-created by Henry Ford. President Hoover and Leaders of Industry Stand By.

THE hands of time were set back on Monday of this week in Dearborn that a venerable old gentleman might renew the scenes of his youth and receive the homage of mankind. It was the dramatic climax of Light's Golden Jubilee, when, in the presence of a distinguished gathering of men prominent in all walks of life, Thomas Alva Edison returned to his shop, his laboratory and his boarding house of 1879 in Menlo Park, New Jersey, now transplanted and restored as the shrine of his genius by his friend Henry Ford.

The Toastmaster and the Host

Picture if you can the atmosphere of an early American village set up on a level plain with a background of wooded land—each building a historic piece transported from its ancient setting to create a living museum of a past era of American life—a village green, a country tavern, a Colonial brick church with a white spire, a little red brick schoolhouse, a livery stable, an old-time general store, a drug store and post office, a town hall, a courthouse, a smithy, a cobbler's shop, a wool mill, a grist mill, a machine shop and quaint log or clapboard houses laid out with spacious village streets of gravel. It is in this setting that Mr. Ford has reconstructed the background of the life of Edison to be a memorial to his name and fame.

The Menlo Park buildings, the office and library, the research laboratory, the carpenter's shop, the carbon house, the machine shop, the glass house, the power station and the Sally Jordon boarding house are there, arranged just as they stood in 1879, when Edison's first incandescent lamp was born. They are rebuilt of the old brick and timbers recovered in many cases from later structures in which the materials had been used. They are furnished again with the original machinery and equipment gathered from countless museums and private owners scattered across the country. Here also is Edison's later laboratory of Fort Meyers, Florida—the scene of many of his subsequent inventions—and close beside it the little office of Luther Burbank, the wizard of plant life and close friend of both Edison and Ford.

On the other side of the village has been resurrected the picturesque setting of that adventure of Edison's early days, well known to every American boy — the Smith's Creek depot. Here it was that young Tom Edison, then a news butcher on the Grand Trunk Railroad, was thrown off the train by an irate conductor because his chemical experiments had set fire to the corner of the baggage car. Beside the depot stands again the old wood-burner locomotive and three cars of that period. To this rejuvenated world of his memories came Thomas Edison with years and honors to participate in the dedication of the Edison Institute of Technology by the President of the United States. He came to re-enact the historic occasion when, after years of research and struggle, he achieved the lighting of the first lamp. Mr. Edison arrived on Sunday and walked through the old buildings. As he gazed upon these old familiar objects and those rooms, endeared to him by all the recollections that came crowding back, he turned repeatedly to Mrs. Edison, to Mr. Ford and others in the party, exclaiming, "I wouldn't have believed it. It's amazing." He chuckled over the presence of red Jersey mud shipped from Menlo Park to carry out the color of his old office yard. As the magnitude of the tribute was borne in upon him he was visibly affected.

Who could witness such a memorial unmoved? The old chairs and desks and the old books are there. The old laboratory apparatus, retorts and bottles, furnaces and molds, the old battery of smoking kerosene lamps

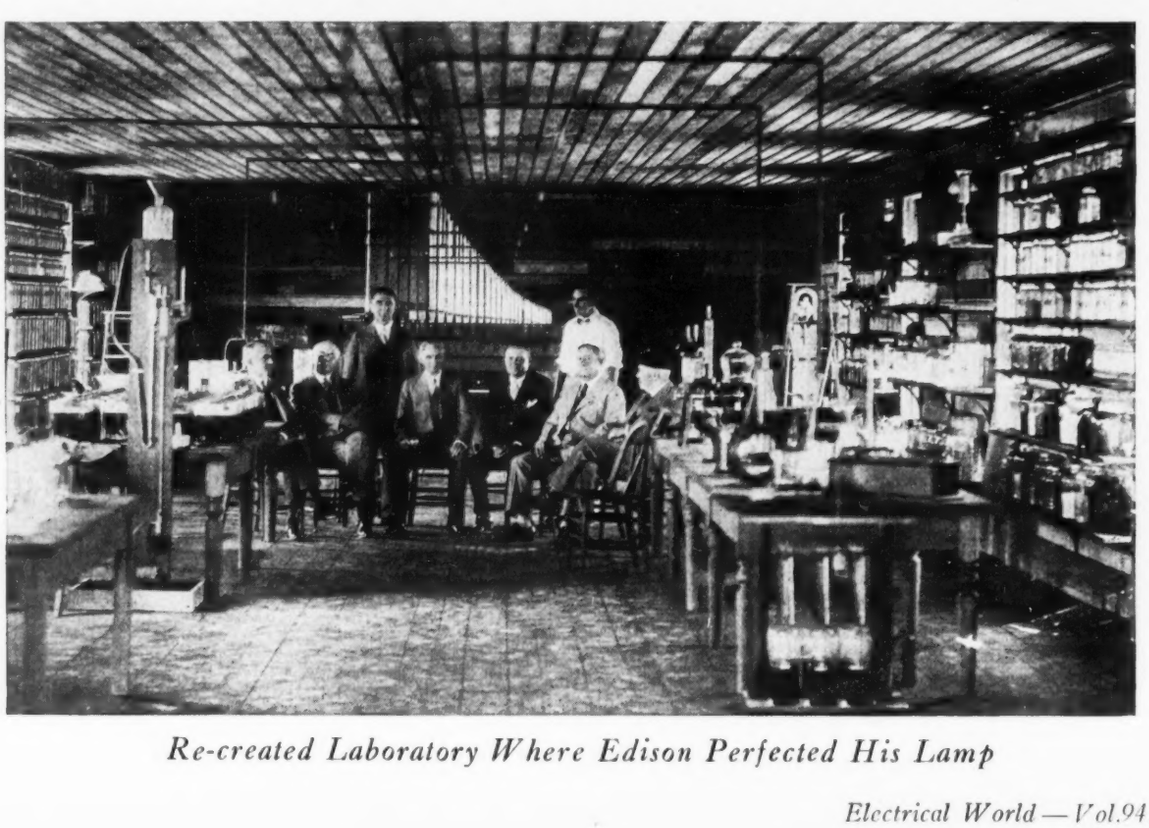
Historic Train from Which Edison Was Ejected as Newsboy

from which carbon was collected. In the little house where bulbs were blown a glass blower was again at work. The old boiler engine and generators were there and the machine shop out in the yard. Even the old pond where scrap and junk were thrown had been provided as of yore. Edison returned to see it all again with a humble spirit and a grateful heart.

In this little village, now called Greenfield, which will become part of the laboratory of the Edison Institute of Technology, there gathered on Monday 500 guests of Mr. Ford, come to pay tribute to the grand old man of electricity on his the 50th anniversary of the invention of the first commercially practical electric incandescent lamp. In addition to the leaders of the electrical industry there were men eminent in science, art and education—a brilliant gathering of notable Americans. They arrived by motor and bus from Detroit.

Mr. Ford's house guests, including Mr. Edison, puffed in on the old Grand Trunk train. They were met and driven about the village in old-time horse-drawn carriages in the manner of 1879. The unfortunate downpouring rain, distressing as it was to all who had so wished for smiling skies to grace the celebration, seemed to make more realistic the illusion of this setting of simple village life.

The day of tribute to the giver of the light closed with a ceremony that will never be forgotten by any who were privileged to be present. On the lower floor of "Independence Hall" (an enlarged reproduction of Independence Hall in Philadelphia), which is to form the central museum of the Edison Institute, the guests of Mr. Ford sat down to dinner to the strains of the early American orchestra. At 7:30 p.m. Mr. Edison, President Hoover, Mr. Ford, Owen D. Young and a small party left



Re-created Laboratory Where Edison Perfected His Lamp

the hall and drove to the laboratory building and there re-enacted the lighting of the lamp. Here Francis Jehl, playing his part of fifty years ago, was occupied as he was then in operating the mercury pump to evacuate the lamp under test. Mr. Edison entered and tried the lamp with battery current. It flashed for only an instant before he broke the circuit and told Mr. Jehl that the vacuum was not yet good enough. Finally the bulb was satisfactorily evacuated, and Mr. Edison prepared to give it the final test of operation with current from a dynamo. He left the laboratory and went over to the machine shop in a neighboring building where the generators are installed. Steam was ready in the original Babcock & Wilcox wood-fired boiler. The nine bipolar dynamos driven by belts coming up through the floor from line shafting below began to spin as Mr. Edison opened the throttle on the single-expansion Brown engine, which is a replica, as the original could not be found. Then the party returned to the laboratory, where Mr. Jehl had sealed off the bulb. Mr. Edison made the connections. The lamp burned—a bright symbol of accomplishment illuminating the faces of the aged inventor and his co-worker as it did half a hundred years ago, when it was only a symbol of hope and those same faces were youthful and unlined.

Every step in the ceremony was described by Graham McNamee over the radio to those at the banquet and to the countless unseen audience that listened in on this eventful night. Suddenly, as Mr. Edison connected the old battery to the lamp, the rich glow of hidden electric floodlights sprang into life in the great candle-lit corridors of Independence Hall, and a thrill ran through the assembly as the "Liberty Bell" in the tower began to ring glad news that history had been remade.

At the conclusion of the re-enactment of the historic scene the party returned to Independence Hall, where Owen D. Young, acting as toastmaster, introduced W. S. Barstow, president of the Edison Pioneers; Mr. Ford, Mr. Edison and Albert Einstein (over the radio from Germany) for short addresses. Owen D. Young, speaking as toastmaster, then said:

"Mr. Edison, to express what is in the hearts and minds of all who hear my voice, my first word must be not one of appreciation of your great inventions or of the service which they have rendered, but rather one of congratulation on that vitality of spirit which makes you do what you do. You come to Greenfield Village today, adventuresome still, as if life lay all ahead of you and none behind. To be sure, the passengers on your railway train took a little more notice of you than they did seventy years ago when you tried to sell them papers.

Edison Institute—the Scene of October 21 Celebration

The greeting at Smith's Creek depot was a little warmer than on that memorable day in 1861, when the railroad people dispensed with your services because you set fire to their cars with this same vitality of which I speak, aided by a little phosphorus.

"That was a great day for the electrical industry; one might say that that industry was largely born at Smith's Creek depot. The same unconquerable will and unquenchable fire which took you out of that depot and set you on your career brings you back to it today, defying the years that have since gone by. It was that vitality of spirit which forced your head to conceive and your hands to execute, which defied sleep as you now defy age. But it did not work alone on your mind and body, and that, I suspect, is the secret of your great success. It worked on and through your heart, and that I know is the secret of this meeting today. Your head and your body, driven to their utmost, could not alone have stood the strain. It needed one thing more, and that you had—a vital sympathy with and generosity toward men—your own assistants and associates. This drew around you at

Menlo Park a group of young men, voluntarily worshiping at your shrine, now known as Edison Pioneers, but who might be known as the apostles of the electrical industry—attracted and held by your enthusiasm, coupled with all the things which make one man serve another.

"As you grew older and projected that vitality in other fields, great leaders and millions of men, women and children have been attracted by it. All seek to do you honor. The President of the United States is here. Millions of people, not alone in your own country but in others, celebrate with you tonight on the radio, and without your lamp as a forerunner the radio would have been impossible. Most conspicuous of the many is our host, Mr. Henry Ford. He has built the Edison Institute of Technology and Industrial Museum in your honor. Other men could have built an institute, but Mr. Ford has done something more."

In concluding his address Mr. Young read greetings and felicitations to Mr. Edison from the Prince of Wales, President von Hindenburg of Germany, as from one octogenarian to another, and from Commander Byrd in Little America in the Antarctic. Mr. Ford was then introduced and bowed his acknowledgments.

The final address (presented elsewhere in this issue) was given by Herbert Hoover, President of the United States, from the brilliantly lighted balcony of the Menlo Park laboratory office. He spoke to two purposes, in appreciation of Thomas Edison's accomplishments in the service of civilization and humanity and in dedication of the Edison Institute of Technology.

Throughout the speaking the guests were conscious of the detonations of fire works and the recurring drum of airplanes participating in a great gala display of illumination outside Independence Hall, bearing testimony to the wonders of this gift of light for which the wizard of Menlo Park has placed the world in debt. The touching words of Mr. Young, the great tribute paid by the President of the United States, the presence of Madame Curie, come from France to add her reverent testimonial to the honor of this man of science were all pallid beside the words of Mr. Edison himself. He arose feeble and trembling with emotion, and expressed his grateful appreciation in these simple words:

I am told that tonight my voice will reach out to the four corners of the world. It is an unusual opportunity for me to express my deep appreciation and thanks to you all for the countless evidences of your good will. I thank you from the bottom of my heart.

I would be embarrassed at the honors that are being heaped upon me on this unforgettable night were it not for the fact that in honoring me you are also honoring that vast army of thinkers and workers of the past, and those who are carrying on, without whom my work would have gone for nothing.

If I have spurred men to greater efforts and if our work has widened the horizon of man's understanding even a little and given a measure of happiness in the world, I am content.

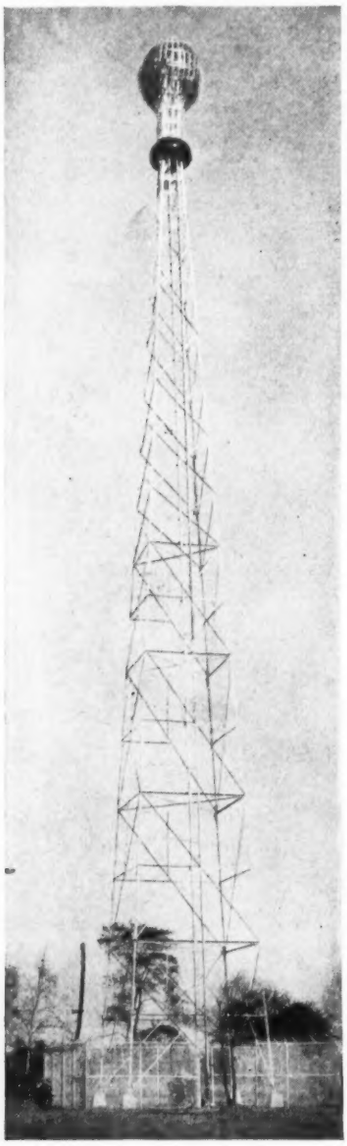
This experience makes me realize as never before that Americans are sentimental, and this crowning event of Light's Golden Jubilee fills me with gratitude. I thank our President and you all.

As to Henry Ford, words are inadequate to express my feelings. I can only say to you that, in the fullest and richest meaning of the term, he is my friend.

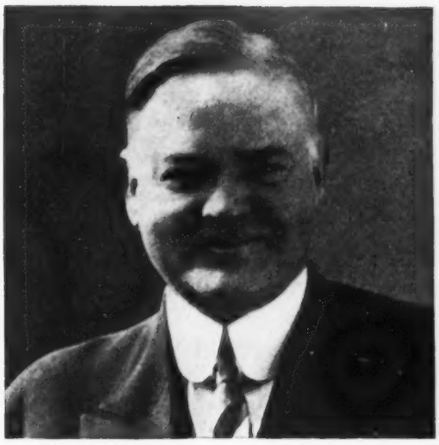
Good night.

Transatlantic reception of the address by Professor Einstein was not good and the audience had perforce to be content with the intention of the message without its words. Charming features of the program were the lilting melodies of old songs and dances furnished by Mr. Ford's old time orchestra.

Menlo Park's Observance



NEXT in importance to the celebration at Dearborn was that at Menlo Park, N. J., birthplace of the incandescent lamp and hence of the electrical industry. Here assembled about fourteen of the Edison Pioneers who had been unable to make the trip to Dearborn, as well as two sons and a daughter of Mr. Edison. The main event was the illumination of a cluster of 800 individual lamps mounted on a 100-ft. tower so as to form a lighting unit 18 ft. high, with a smaller lamp at the foot of the tower—a reproduction of the original Edison lamp—which is to burn perpetually. This installation was made by the Edison Lamp Works. The lights came on when Mr. Edison touched a button at Dearborn. Former Governor George Silzer made an address, and the Dearborn program came through the loud speakers.



Our Priceless Possession

By President Herbert Hoover

THIS ceremony* is a part of the celebration of Mr. Edison's invention of the electric lamp. It is also the dedication of the Edison Institute of Technology, the gift of Mr. Ford. Both are in fact national tributes to Mr. Edison.

The multiplication of the amount of light in the world a thousandfold is worthy of celebration, for darkness is a forbidden limitation upon righteous human activities.

When Mr. Edison invented the electric lamp he may perhaps have thought just to produce plain light and more of it at less cost. I surmise that his wildest ambition was to relieve the human race from the curse of always cleaning oil lamps, scrubbing up candle drips, and everlastingly carrying one or the other of them about. He may have thought to add safety to Chicago against a second accident from an oil lamp. But the electric lamp has found an infinite variety of unexpected uses. It enables us to postpone our spectacles for a few years longer; it has made reading in bed infinitely more comfortable; by merely pushing a button we have introduced the element of surprise in dealing with burglars; the goblins that lived in dark corners and under the bed have now been driven to the outdoors; evil deeds which inhabit the dark have been driven back into the farthest retreats of the night; it enables the doctor to peer into the recesses of our insides; it substitutes for the hot-water bottle in aches and pains; it enables our cities and towns to clothe themselves in gaiety by night, no matter how sad their appearance may be by day. And by all its multiple uses it has lengthened the hours of our active lives, decreased our fears, replaced the dark with good cheer, increased our safety, decreased our toil, and enabled us to read the type in the telephone book. It has become the friend of man and child throughout the world.

*Address at Dearborn, Mich., October 21.

In making this, as in his other great inventions, Mr. Edison gave an outstanding illustration of the value of the modern method and system of invention, by which highly equipped, definitely organized laboratory research transforms the raw material of scientific knowledge into new tools for the hand of man.

In earlier times mechanical invention had been the infrequent and haphazard product of genius in the woodshed. But science had become too sophisticated a being to be wooed in such surroundings. Nowadays a thousand applied science laboratories, supported by industries of our country, yearly produce a host of new inventions.

I can perhaps illustrate this modern method of invention. The fundamental natural laws of electricity were discovered three-quarters of a century ago by Faraday, Hertz, Maxwell and other great investigators in the realms of pure physics and mathematics. Faraday discovered that energy could be transformed into electricity through induction—the theory of the electrical generator. It was one of the momentous discoveries of history. It is related that Mr. Gladstone was induced to visit Faraday's laboratory to see this new scientific contraption. When Gladstone is said to have made the characteristic practical man's inquiry, "Will this ever be of use to mankind?" Faraday replied, "Some day you will collect taxes from it."

Mr. Edison, using organized systematic laboratory research, has been one of the great leaders who have converted the pure physics of electricity into a taxable product. Today the governments of the world levy upon upward of sixty billions of new wealth founded upon electricity.

But the taxes and new wealth are not the major accomplishments of the mind of this genius. These are the rivers of sweat saved

OUR SCIENTISTS AND INVENTORS *are among our most priceless national possessions. There is no sum that the world could not afford to pay these men who have that originality of mind, that devotion and industry to carry scientific thought forward in steps and strides until it spreads to the comfort of every home.*

from the backs of men and the infinite drudgery relieved from the hands of women.

I may emphasize that both scientific discovery and its practical application are the products of long and arduous research. Discovery and invention do not spring full grown from the brains of men. The labor of a host of men, great laboratories, long, patient, scientific experiment build up the structure of knowledge, not stone by stone, but particle by particle. This adding of fact to fact some days brings forth a revolutionary discovery, an illuminating hypothesis, a great generalization, or a practical invention.

Most Potent Impulse to Progress

Research both in pure science and in its application to the arts is one of the most potent impulses to progress. For it is organized research that gives daily improvement in machines and processes, in methods of agriculture, in the protection of health, and in understanding. From these we gain constantly in better standards of living, more stability of employment, lessened toil, lengthened human life, and decreased suffering. In the end our leisure expands, our interest in life enlarges, our vision stretches. There is more joy in life.

It is the increasing productivity of men's labor through the tools given us by science that shattered the gloomy prophecies of Malthus. More than a century ago that great student held that increasing population would outrun the food supply and starvation was to be the inevitable executioner of the overcrowded earth.

But since his day we have seen the paradox of the growth of population far beyond anything of which he ever dreamed, coupled at the same time with constantly increasing standards of living and ever-increasing surplus of food. Malthus was right except for a new contestant in the race with his principle: That was more scientific research, more discovery. And that race is still on. If we would have our country improve its standards of living and at the same time accommodate itself to increasing population we must maintain on an even more liberal scale than ever before our great laboratories of both pure and applied science.

A Priceless National Possession

Our scientists and inventors are among our most priceless national possessions. There is no sum that the world could not afford to pay these men who have that originality of mind, that devotion and industry to carry scientific thought forward in steps and strides until it spreads to the comfort of every home; not by all the profits of all the banks in the world can we measure the contribution which these men make to our progress. And they are the least interested in the monetary results. Their satisfactions are in their accomplishment—in the contribution of some atom of knowledge which will become part of the great mechanism of progress. Their discoveries are not the material for headlines. Their names are usually known to but a few. But the nation owes them a great honor and is proud to demonstrate through Mr. Edison today that their efforts are not unappreciated. The country can well pay its tribute to the men of this genius by expanding the facilities for their labors. The nation today needs more support for research. It needs still more laboratories. To that Mr. Ford is making a generous contribution.

And in establishing this institute, Mr. Ford is doing honor to Mr. Edison in a manner which appeals to our sense of the fitness of things; that is, by founding an institution dedicated to education and scientific research.

And scientific research means more than its practical results in increased living comfort. The future of our nation is not merely a question of the development of our industries, of reducing the cost of living, of multiplying our harvests, or of larger leisure. We must constantly strengthen the fiber of national life by the inculcation of that veracity of thought which springs from the search for truth. From its pursuit we shall discover the unfolding of beauty, we shall stimulate the aspiration for knowledge, we shall ever widen human understanding.

Mr. Edison has given a long life to such service. Every American owes a debt to him. It is not alone a debt for great benefactions he has brought to mankind, but also a debt for the honor he has brought to our country. Mr. Edison by his own genius and effort rose from modest beginnings to membership among the leaders of men. His life gives renewed confidence that our institutions hold open the door of opportunity to all those who would enter.

Our civilization is much like a garden. It is to be apprised by the quality of its blooms. In degree as we fertilize its soil with liberty, as we maintain diligence in cultivation and guardianship against destructive forces, do we then produce those blossoms, the fragrance of whose lives stimulate renewed endeavor, give to us the courage to renewed effort and confidence of the future.

New History Made

NEW HISTORY was made on the night of the Edison celebration, October 21, when Professor Albert Einstein's tribute to Mr. Edison was broadcast from Berlin, Germany, across the Atlantic to Dearborn, Mich., and then rebroadcast throughout the country. This was the first occasion when all radio listeners in the United States could hear the voice of one speaking from so distant a place as Berlin. The transmission from Berlin was over the standard long-wave system of the American Telephone & Telegraph Company.

The message of Professor Einstein translated into English was as follows:

"My Dear Mr. Edison: It affords me an unusual pleasure to be permitted to send you my greetings from this most distant point. The intellectual workers everywhere, especially physicists and technicians, today address their thoughts to you and your achievements in a spirit of admiration and devout sympathy.

"You have been equally successful as pioneer, as developer and as organizer. Your construction of the incandescent lamp has made possible the development of a mighty electrical industry.

"The technical geniuses of the world, of whom you are one of the most successful, have confronted mankind with a new situation in the course of the past half century—a situation to which it has not yet succeeded in adapting itself.

"Today man no longer requires the use of his muscles to obtain those commodities necessary for the maintenance of life. He no longer needs to function as a motor or a slave.

"The creative geniuses of coming generations in all probability will be the leaders of men whose duty it shall be to divert the resources of technique from the purposes of war into the service of economic welfare and the liberation of mankind."

Small Plant Rehabilitation

Saves $15,000 Yearly

By G. T. SHOEMAKER
Electrical and Mechanical Engineer
United Light & Power Engineering & Construction Company, Davenport, Iowa

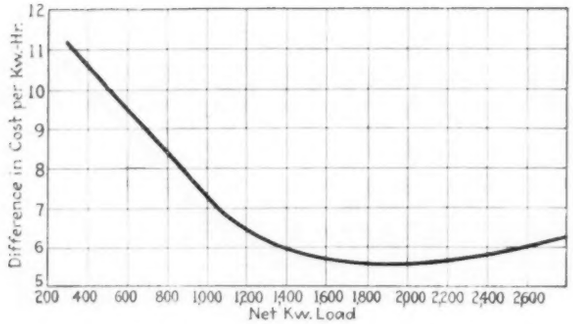
Norfolk Station as It Appears Today

Addition of generating capacity to transmission type system provides opportunities for major economies in rehabilitation and extension of existing plant as against large expenditure for new station

AN INVESTMENT saving of at least $80,000 and an annual operating economy of $4,000, the two amounting to nearly $15,000 in annual charges, plus the deferring of an expenditure of $45,000 for three or four years, were achieved in the reconstruction of the Norfolk, Neb., power station of the Iowa-Nebraska Light & Power Company. The generating plant was an inheritance from the previous operations of a privately owned utility and was kept in operation because the town was the logical center of an operating division of the company. For a time the plant was adequate for the local needs, but it became apparent that an increase of capacity must be provided.

The nearest points from which power in any quantity could be secured were 120 and 140 miles away. The provision of additional transmission capacity to supply the growing load would be an expensive proposition and at the best would offer a service quality subject to the normal contingencies of transmission line supply. Obviously, the thing to do was to rebuild the Norfolk plant to provide the capacity for future growth. But this plan presented difficulties owing to the condition of the plant and to some features of its location. Another factor contributing to the complexity of the situation was that although in the ordinary conception of system design it would be natural to regard the rebuilt station as a base-load plant, the complete acceptance of this idea was prevented by the presence of a number of adjacent small water powers of 100 to 200-kw. capacity each, which, on account of limited water storage facilities, had to be operated quite close to the natural variation of water availability. At certain times of the year these plants, if they were to be of any value in the system at all, had to be regarded as taking the best proportion of the base load. This condition militated against taking advantage of load to operate the steam plant at its most efficient point on as high load factor as was possible.

The equipment in the plant, while it nevertheless continued to grind out kilowatt-hours, was largely in a state of near obsolescence and any addition to plant capacity must contemplate the replacement of this equipment, or, at least, its extensive rehabilitation. The plant contained one 1,000-kw. turbine, one 500-kw. turbine and a 500-kw. uniflow engine unit. The boilers were two

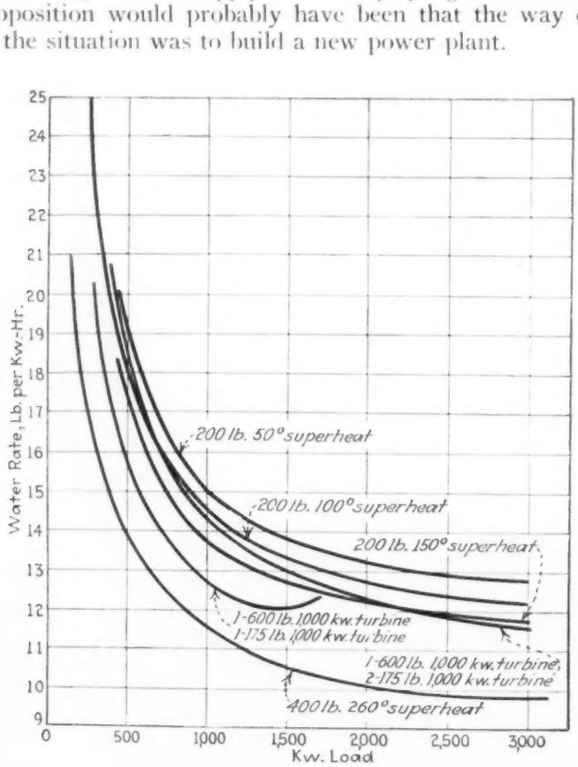


Generating Cost for 200-Lb. and 400-Lb. Installations as Considered for Norfolk Station

250 hp., one 400 and one 500 hp., all nominally rated at 200 lb., but the two smallest ones were held to 165 lb. by boiler inspection rating. Testifying to the short-sightedness of its original designers, the plant was located about 4,500 ft. from a branch of the Elkhorn River which flows through the town and the condensing water was taken from wells on the property.

Move, Rebuild or Rehabilitate

It was out of the question to move the plant to a new location on the river branch and the problem presented itself in terms of providing means for expansion at the existing location. At the time when the decision as to the provision of additional capacity was necessary the load at Norfolk was about 2,200 kw., only about half of which was supplied by the power station. The generating efficiency of the station was low, principally on account of the high water rate of the two turbines and the engine and also because of the insufficiency of the condensing water supply. A snap judgment on the proposition would probably have been that the way out of the situation was to build a new power plant.

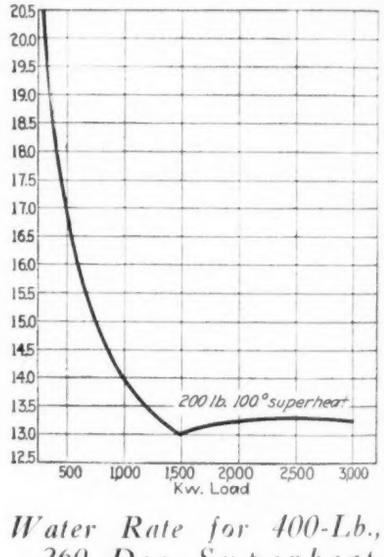


Comparative Water Rates of Turbine Installations Considered for Norfolk Power Plant

In the face of the generating economies made possible by the use of higher steam pressure it was obviously poor engineering to add to the plant at the 200-lb. steam pressure. Analyses of the probable performances of various high pressures were made and are brought together for comparison in one of the accompanying graphs. One set-up considered the installation of a 200-lb., 3,000-kw. turbine, another a 400-lb., 3,000-kw. machine, and the third three 1,000-kw. turbines, two of which operated from the exhaust of a 600-lb. machine. The curves show the very obvious merit of the second proposition over the two others. In the matter of investment, the 600-lb. alternative was so far out of line as to put it out of the running entirely. The decision lay between the 200- and 400-lb. installations.

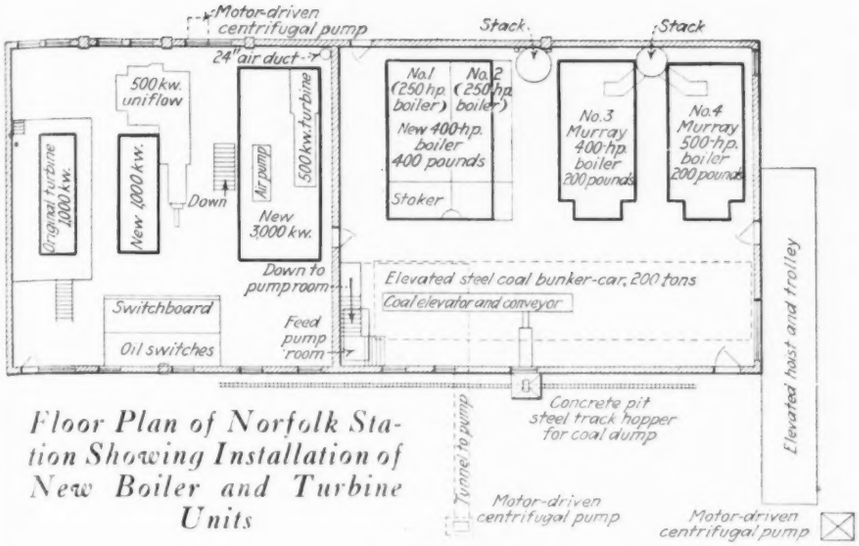
400-Lb. Boilers Chosen

Close inspection revealed that the two larger boilers already installed in the plant were in fairly good shape and with a few repairs could be brought up to a condition of acceptably efficient operation. Installing a 200-lb. turbine would therefore require only the replacement of the two 250-hp. boilers and the two other boilers could be retained for reserve capacity. On the other hand, a 400-lb. installation apparently would require the installation of two 400-lb. boilers in order to provide the necessary reserve. On this basis of comparison the investment required for the higher pressure was so much greater as to nullify the operating economy that could be secured by a 400-lb. turbine, but a way out of this difficulty was discovered. It was suggested that the new turbine be supplied with special nozzle and valve equipment so that, if necessary, it might be operated at a 200-lb. steam pressure. It would thus be possible to run the turbine in normal operation at 400 lb. and to use the 200-lb. boilers for reserve. As is indicated by the accompanying curve, the water rate of the turbine would be higher at the lower pressure, but the times of such operation would be infrequent and the periods of their duration comparatively short, and it was felt that the lower economy could be endured during those occasions on account of the major investment savings it made possible.



Water Rate for 400-Lb., 260-Deg. Superheat, 3,000-Kw. Turbines Operating at 200 Lb. with 100 Deg. Superheat

On the basis of two 400-lb. boilers the cost comparison between the 200- and 400-lb. installations was of the order of $239,000 to $343,000, but by the elimination of the second 400-lb. boiler this comparison was brought from $239,000 to $263,000, a difference of only $24,000. These figures include not only the actual cost of the equipment and its installation but also the necessary reconstruction of the plant required by either alter-



Floor Plan of Norfolk Station Showing Installation of New Boiler and Turbine Units

native. The apparently large difference caused by the elimination of only one boiler was caused by the fact that the installation of this unit would entail a more extended wrestling with the quicksand which had been discovered to underlie the plant. Thus, through a trivial additional expense incurred by the special turbine design, there was saved the $80,000 earlier mentioned. This saving, in terms of the fixed charge ratio used by the company, amounted to $10,800 per year.

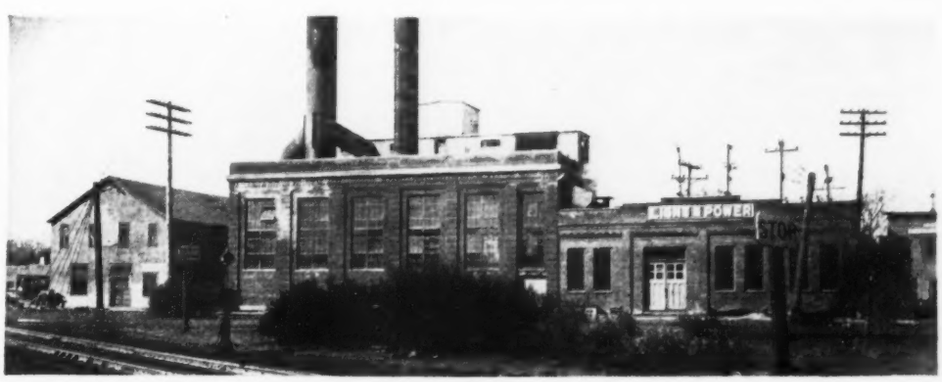
The investment difference of $24,000 between the 200-lb. and the revised 400-lb. installation amounted to $3,300 per year. Assuming that the plant had an annual output of 12,300,000 kw.-hr., a figure not at all out of line in consideration of the rapidly increasing load of the division, the better economy of the high-pressure installation expressed itself as a saving of $7,250 per year. This saving is to be balanced against the annual cost of the additional $24,000 investment, giving a result of $3,900 as a direct return of about 16 per cent on $24,000.

Condensing Water from Wells

The total picture of savings made in the reconstruction of the Norfolk plant does not stop here. Mention was made earlier that the plant was located a considerable distance from the river and that the condensing water supply was apparently inadequate from the wells on the property. The maximum possible vacuum that could be obtained by the old plant was 26 in. for short periods and the normal operating condition gave a vacuum of about 23 or 24 in. Apparently the thing to do to correct this condition was to install intake and discharge ducts between the plant and the river. But this installation would cost in the neighborhood of $45,000, and before making the decision to go ahead with it it was decided to investigate the wells on the property a little more closely. These wells were provided with ordinary suction type pumps. When the water had been pulled down to 30 ft. below the surface there was an end to the supply. Purely in a spirit of curiosity, one of the wells was equipped with a deep well pump costing about $1,100. It was found that the suction pump had not been able to reach the lower limit of the water table and that the deep well pump would supply sufficient water to permit a much higher vacuum on the old installation. The performance of the one new pump was such as to assure that two of them would be enough to supply water for the new 3,000-kw. turbine, and accordingly the second one was bought. It will probably be necessary to install a third by the time the new turbine gets loaded up to its capacity and before another addition to plant is required. When this time comes the intake and discharge duct from the river will undoubtedly be required, but in the meantime, and for three or four years in the future, this expenditure of $45,000 has been deferred. At an expense of $3,300, a fixed charge of between $5,000 and $6,000 per year is being staved off for at least three and possibly four years.

Result of the Changes

The reconstructed plant, as it is shown in the accompanying illustration, now contains 5,000 kw. of turbine capacity in three units. One of these is the 1,000-kw. machine which was in the old plant, the second is another 1,000-kw. machine which was removed from another power station of the company, both of these machines operating at 200-lb. steam pressure. The third unit is the new 3,000-kw., 400-lb. machine, which normally carries the load, the two others being standby equipment. The boiler installation consists of the two old 200-lb. boilers of 400 and 500 hp. each and a new Heine boiler with a box header rated at 440-lb. maximum pressure and 385 hp. As may be seen, the appearance of the plant has been definitely changed for the better and it is now in such shape as to be a definite credit to any transmission type utility system.



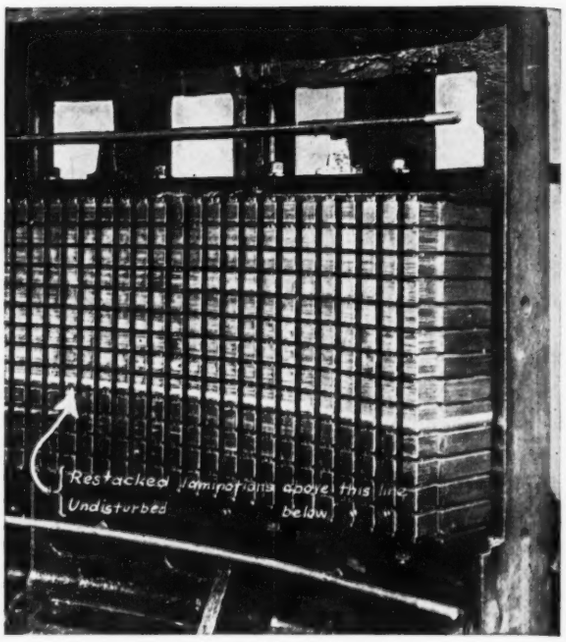
Norfolk Station Before Rehabilitation

Generator Shut-down Reduced by Field Repairs

By C. A. Barton
Superintendent of Rolling Stock and Shops
Rio de Janeiro Tramway, Light & Power Company,
Rio de Janeiro, Brazil

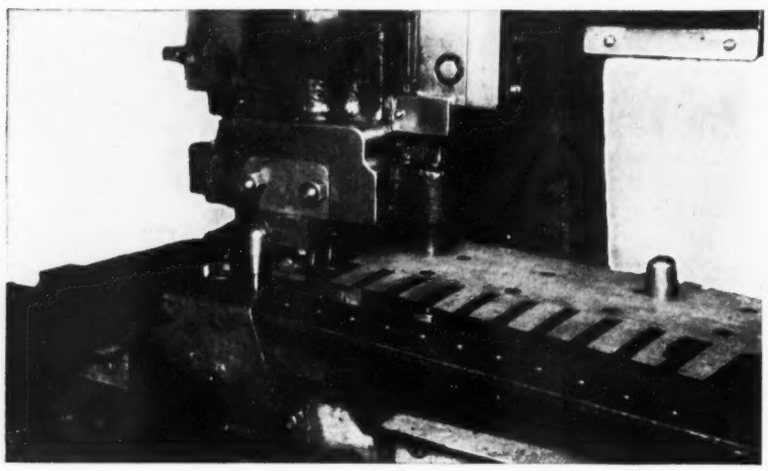
WHEN one of the 12,500-kva. vertical waterwheel machines of the Rio de Janeiro Tramway, Light & Power Company, Ltd., in Brazil burned out recently it was found that one-half of the winding had been destroyed and that two large holes had been burned in the iron of one of the quarter sections. The damage to the iron was too extensive to permit the possibility of restacking and redistributing the damaged iron. A spare winding was on hand.

The question of repairing damaged apparatus is always a serious one for power companies operating in foreign countries and at a considerable distance from the manufacturers of their equipment, and in this instance the advantage of maintaining a fully equipped machine shop in such locations was clearly shown.



Badly Burned Laminations Replaced

White line marks limit of damaged area in which field repairs were made from old transformer iron.



Generator Laminations Prepared in Local Machine Shop

The small holes were made in the original use of the iron for the transformer laminations.

Core iron of suitable dimensions, from an old power transformer, was available and it was decided to make new laminations locally rather than to await the shipment of such material as might be ordered by cable. In order to do this a pedestal was erected at a suitable distance from a Bliss No. 21½ press to furnish the pivotal point about which could swing a framework which should control all press operations. After shearing the sheets to approximate size one bolt hole was punched, which in connection with a fixed stud properly located enabled the second hole to be punched accurately. From that point on these holes served as points of reference and the laminations could be removed and replaced at will. Two laminations were punched at a time, and although it was necessary to index thirteen times results were quite satisfactory.

The dovetails on the back of lamination were developed by cutting away surplus material in a subsequent operation, using special tools. The final operation was handled in a guillotine shear and was to trim ends, always registering by aforesaid bolt holes. These laminations to the number of 2,500 assembled conveniently and for interchangeability compared well with factory product. For the most part the insulation on the laminations was good, but where it showed signs of flaking off it was reinsulated. Because the gage of the new iron was slightly smaller than the old it was necessary to install it in a complete layer throughout the quarter section. Each layer of new iron was placed between two or three layers of old iron.

When the rewinding of the stator was completed tests showed that the generator could carry its rated output without any greater temperature rise than had previously been obtained, and that the temperature rise of the new iron was only 2 or 3 deg. higher than that of the old. The generator was actually placed back in service before the material ordered by cable for the repairs was shipped from New York.

Long-Span Rear-Lot Line Distribution

VARIOUS factors that interfere with the adoption of longer spans for distribution lines along property frontage are absent when rear-lot line distribution is considered. One company is planning jointly with the telephone company to build to 180-ft. spacing and use a "Copperweld" neutral also as a messenger. The copper line conductors will be supported at intermediate intervals from racks attached to the messenger.

Flying taps for services will be made from insulators also attached to the messenger. It is expected that this construction will not only effect material economy but at the same time overcome some of the difficulties encountered in dodging garages in running services from poles.

Economical Pole Setting

Comparison of expense of manual and machine methods. Variability of soils, labor rates, accounting practices and other conditions prevents general conclusion regarding machine economy

ANALYSIS of unit costs for digging holes and setting poles from data furnished by a group of operating companies in the lake states indicates that it costs approximately 2.3 times as much to dig a hole by hand as it does with an earth-boring machine. For both digging and setting, considering them as one operation, the manual costs 2.2 times as much as the machine method. These conclusions were presented to the overhead systems committee of the Great Lakes Engineering Section, N.E.L.A., by E. J. Kallevang, chief engineer Wisconsin Power & Light Company.

The condition and nature of the soil is undoubtedly the most influential factor in digging costs. If the soil is sandy one man can dig approximately ten holes per day, but in rock one hole per day may be the best he can do. The importance of this factor is shown by a typical case in which labor is taken at 40 cents per hour for nine hours, incidentals at 20 per cent of labor and supervision and tool expense at 35 per cent, making a total of $5.58 per man per day. The cost per hole will vary inversely as the number of holes this man can dig, ranging from $5.58 for one to 56 cents each for ten.

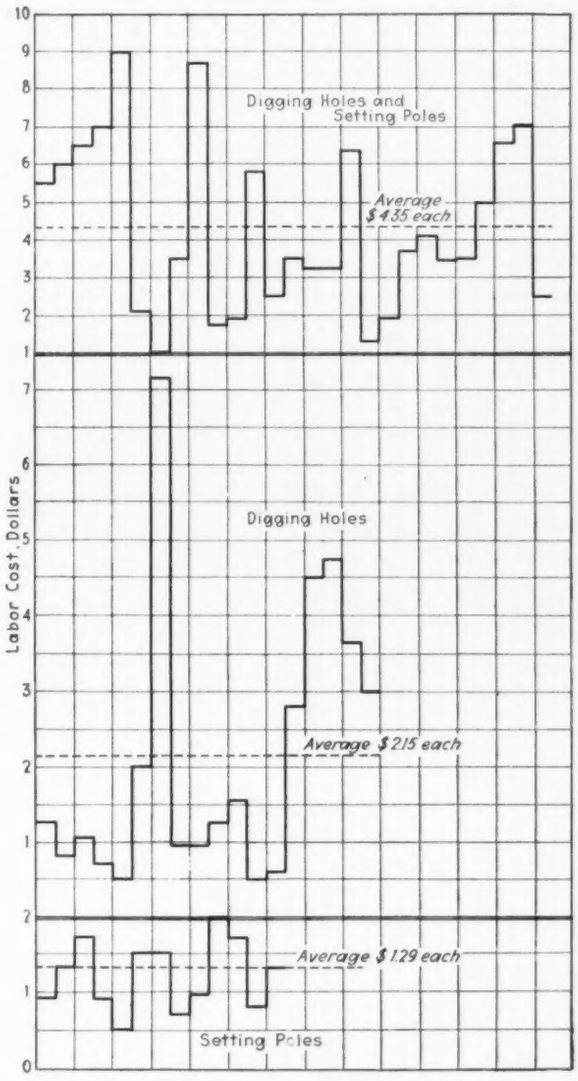
A boring machine can dig from fifteen to one hundred holes or more per day. Soil conditions also affect the performance of the machine, but the machine effects the greatest economy when the digging is hard. When digging is easy a smaller percentage of the total unit time is required to dig the hole than is required to move and set the machine. From this it follows that the saving per hole dug is greatest with the machine, when digging is hard, for the reason that only a small amount of time is lost in moving and setting up.

Table I—Man-Hours per Pole

Size of Pole, Ft.	Hauling Poles	Digging Holes	Setting Poles
25	1.02	2.14	2.38
30	1.26	3.10	2.98
35	1.63	4.30	4.08
40	1.82	5.54	4.66

The number of holes which a man can dig per day depends also upon the size and depth of the hole. Table I shows the average number of man-hours required per pole erected for the various sizes of poles.

This particular time study indicates that it requires more than double the man-hours for digging a hole for a 40-ft. pole than is required for a 25-ft. pole. From this it follows that with labor at 40 cents per hour the cost of digging a 6-ft. hole is approximately $1.40 greater than for a 5-ft. hole. The reason for the decided increase in man-hours results not only from the larger diameter hole but also from the fact that the time required to move a cubic-foot of earth from a hole increases rapidly as the depth of the hole increases.



Labor Costs for Digging Holes and Setting Poles by Hand

Each horizontal line represents one utility.

Although the cost of digging holes in the city should not differ greatly from the cost of digging holes in the country, when no obstructions are encountered, such obstructions do affect unit costs. It is conceded that the cost of distributing and setting poles in urban districts is greater than in rural. A comparison between rural and urban labor costs such as are shown in Table II indicates this difference in some communities.

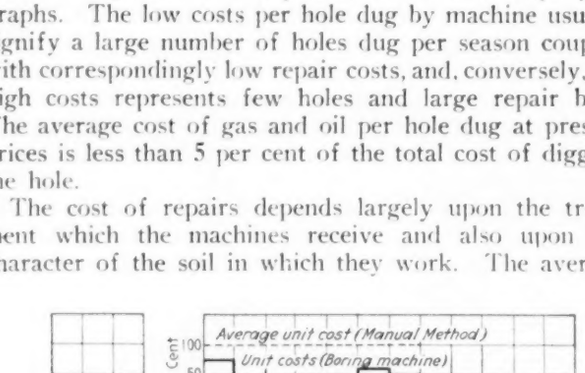
Table II—Costs of Pole Erection in Country and City

	Rural Work, Per Cent	City Work, Per Cent
Digging holes	100	149
Setting poles	100	187
Distributing poles	100	109
Total	100	153

The costs given for the manual method do not include overhead, transportation expense, etc. On the other hand, earth-boring machine unit costs in most cases include overhead costs, transportation expense and tool costs. Unproductive hours of labor should also be included in the total costs for both methods; this item in most of the cases here included is not given any consideration.

The cost experiences of a number of companies with earth-boring machines are presented in the accompanying graphs. The low costs per hole dug by machine usually signify a large number of holes dug per season coupled with correspondingly low repair costs, and, conversely, the high costs represents few holes and large repair bills. The average cost of gas and oil per hole dug at present prices is less than 5 per cent of the total cost of digging the hole.

The cost of repairs depends largely upon the treatment which the machines receive and also upon the character of the soil in which they work. The average



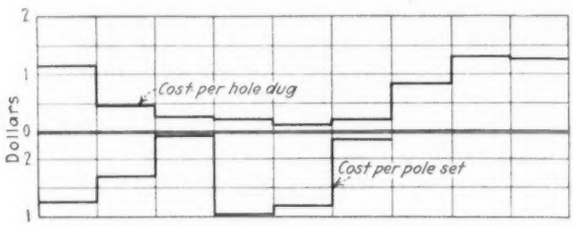
Comparative Costs of Digging Holes and Setting Poles

Each horizontal line represents one utility.

repair cost per hole dug is approximately sixteen per cent of the total unit cost.

The interest, depreciation and tax item per unit are influenced by several factors. If the operating company is small and uses the machine only a small portion of the year, or if the work of larger companies slackens to a considerable extent, the depreciation unit cost figure increases somewhat. The original cost of the machine and the depreciation period also have considerable bearing on this item. Most companies usually depreciate their machines over a four-year period.

In most cases the tractors and trucks carrying the earth-boring machine are equipped with both winch and gin. Immediately after the hole is dug the machine is



Gas, Oil, Repair and Depreciation per Hole Dug and per Hole Set by Machine

Each horizontal line represents one utility.

moved forward a few feet, the pole is picked up and is set into the hole. The majority of boring machine crews consist of three or four men, namely, the truck driver, the boring machine operator and one or two helpers. Labor costs for earth-boring machines vary from 18 cents to $2 per hole, depending upon labor rates and soil conditions; this item constitutes about 50 per cent of the total unit cost.

The average unit labor cost (manual method) for 30-ft. and 35-ft. poles is as follows:

Digging holes, each	$0.93
Hauling poles, each	0.86
Setting poles, each	1.12
Total	$2.91

Because the data shown on the accompanying graphs include a large number of pole sizes, their averages are higher than those shown above.

Keeping Down Costs of Rights-of-Way

THE time to begin to cut down expense in the construction of transmission lines is at the very beginning of the job. So believes one company operating a large system in the Middle West. A series of well-defined policies and practices in the securing, clearing and maintaining of rights-of-way have proved to yield definite economies.

In the first place, the company does not buy rights-of-way in outright fee. It uses an easement contract by which the land owner permits a line or lines to cross his property. His use of the land traversed by the line or lines is restricted only in that he may not erect any structures under the line without the consent of the company. The easement is naturally much easier and less costly to secure than is outright ownership of the right-of-way.

In the matter of clearing, the company has found that if such an arrangement can be made, it is definitely less expensive to contract the job to local labor than it is to send in company men. For the original clearing, the practice is for the company to buy the standing timber from the landowner, employ him to remove it and then give it to him. When an owner knows that his easement

of a right-of-way will be followed by a contract advantageous to himself he is unlikely to attempt a hold-up. From the company's standpoint the actual cash paid for the timber and for its removal and the loss entailed by giving it back is much less than the cost of bringing in a gang to do the clearing.

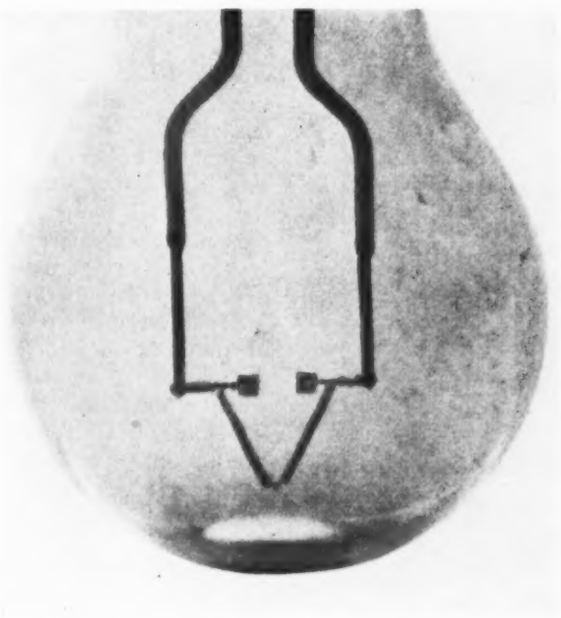
In these contracts, and also in contracts for clearance maintenance, the contractor is expressly stated as not being an employee of the company. He is an independent operator who agrees to do a certain job for fixed considerations. The contract stipulates a period for its completion and provides for enforcement of its terms by cancellation or legal recourse. The operation of these right-of-way policies and methods has been found to be uniformly successful and there have been large savings.

An Epochal Light Source

New type S-1 tungsten-mercury arc supplies radiant energy for health as well as light for vision

By M. Luckiesh

THE advent of a new electric light source is a rare event even in this era of extraordinary scientific development. If the new source is comparable in simplicity with tungsten-filament lamps the event is truly a great one and the imagination sees great possibilities ahead. Finally, if the new arrival, besides being an illuminant of generally satisfactory quality, supplies health-giving radiation, interest in it overflows the bounds of lighting in its present broadest sense. Such a source has recently been born after years of development work by R. F. Strickland of the incandescent lamp department of the General Electric Company.



Electrodes Shunted by Filament in Presence of Mercury Constitute Light Source in New Lamp

The new source is a simple combination of a tungsten filament and a mercury arc between tungsten electrodes. It has been recognized for many years that the deficiency in the red end of the spectrum of a mercury arc limits the acceptability of this illuminant. By combining with the mercury arc a tungsten-filament lamp, emitting a continuous spectrum rich in red rays and also in others which fill the gaps of the mercury spectrum, the quality of light becomes widely acceptable. Furthermore, it is well known that the mercury arc emits health-giving ultra-violet radiation of wave lengths found in midsummer sunlight and also short-wave ultra-violet radiation which does not reach the earth's surface from the sun. Therefore, by controlling the spectral transmission of the inclosing glass bulb the extent of the spectrum in the ultra-violet can be controlled as desired.

The new source is at present designated as the type S-1 lamp. The relative amounts of light (as measured visually with a photometer) from the arc, electrodes and filament are under the control of the lamp designer and can be varied somewhat as experience dictates. At the present time the filament supplies approximately 7 per cent of the total light output, the arc about 25 per cent and the electrodes the remaining 68 per cent. The V-shaped tungsten filament hangs downward from the supports. When current is supplied to the filament, mercury from a pool beneath it is vaporized and almost instantly the current arcs across the space between the electrodes. At present the lamp is designed to operate throughout a wide range of angles of the lamp-axis with the vertical.

The type S-1 lamp is essentially a low-voltage source and the volt-ampere characteristic of the transformer is very important. The no-load volts of the secondary are approximately 35. When the switch is closed the filament takes about 9 amp. and the drop across it is approximately 33 volts. Almost instantly the arc begins to operate without any further operation on the part of the user. Now the mercury arc between tungsten electrodes is operating in parallel with the tungsten filament; the volts have dropped to about 11 and the total current passing through the filament and the arc is approximately 30 amp. Obviously this new source operates only in equipment designed for it and for the present the portable equipment is intended only for alternating-current circuits of the standard voltages—110-125.

In the development of this source it has been the aim to approximate the effects of midsummer mid-day sunlight. It is known that the health-giving rays of solar radiation are maximally effective between the wave lengths of 3,100A deg. and 2,900A deg. The solar spectrum does not extend beyond λ2,900 and the energy

decreases very rapidly from λ3,000 to λ2,900. Whatever the health rays of sunlight are it is unnecessary for normal eyes to be protected by means of goggles. The fields of great promise for this new artificial source demand that the radiation emitted should be limited to the region of the spectrum, which is not harmful to the eyes. This has been achieved approximately so that this radiant energy emitted by the type S-1 lamp can be considered to be as safe as the sun. However, we do not look at the sun and we exercise judgment and caution in exposing ourselves to midsummer mid-day sunlight. If we are to

Midsummer Sunlight Simulated by New Lighting Source

have the same radiation from an artificial source we must also exercise the same cautions.

In conserving and in controlling ultra-violet radiation it is necessary to know the spectral reflection and transmission characteristics of materials[1].

Aluminum and chromium are satisfactory and oxidized aluminum is particularly efficient in its reflection of ultra-violet radiation of the wave lengths of primary interest. Vitrified porcelain enamel is unsatisfactory because the "glass" constituent absorbs the so-called vita-rays. Other so-called porcelain enamels vary considerably owing to the spectral reflection characteristics of the "white" pigments. For example, zinc oxide absorbs practically all the ultra-violet radiation. On the other hand, some white pigments are quite efficient reflectors of vita-rays. Of course, the vehicle in which the pigments are suspended and eventually "fixed" is also important.

As to the effectiveness of the radiation from this new source it is sufficient for the present to compare it physically with solar radiation and the radiation from the quartz mercury arc. It may be said to lie between them, but practically it is close to midsummer sunlight. Inasmuch as both these sources have been accepted by the medical profession as being effective in the prevention and cure of diseases the conclusion pertaining to the radiation from the new source is obvious. However, diseases should be in the hands of medical men, but health can always be in the hands of the individual. It remains for the medical profession to appraise the type S-1 lamp for its own use. From the viewpoint of the physics of its radiation it provides an artificial sunlight which can accomplish what natural sunlight does.

The exposures which are necessary and safe depend upon the design of the reflector as well as upon the primary voltage for a given lamp. An average of many tests indicates that, as measured in foot-candles, the radiation from the type S-1 lamp is of the order of magnitude of twenty times more effective in producing erythema (reddening of the skin) than mid-day midsummer sunlight with a moderately clear atmosphere. The susceptibility of the skin of an individual varies widely over the various portions of the body. Furthermore, the susceptibility of the skin of individuals varies widely. Every one knows that a small percentage of skins is very sensitive to solar radiation. However, for most persons the sensitiveness of various portions of their skin and also of the individuals varies approximately from one to three in relative terms. A fairly permanent tan results from successive reddenings of the skin exposed to sunlight or to the artificial sunlight of the type S-1 lamp. A good tan is a protection against reasonably excessive exposures to ultra-violet radiation from these two sources without eliminating the effectiveness of the health rays.

Much scientific research is needed in this entire field of radiation as a health influence. However, sufficient knowledge is available to welcome heartily a source which approximately produces an artificial sunlight of the same effectiveness and safety—and necessity for cautious use—as midsummer mid-day sunlight. Extensive researches have already been made with type S-1 lamps and others are in progress. Space does not permit a discussion of these, but with the glimpses presented the electrical interests can readily see that an epochal source has appeared upon the scene and that a new era of lighting for health as well as vision is glowing upon the horizon.

[1] "*Spectral Reflectances of Common Materials in the Ultra-violet Region*," by M. Luckiesh, *Journal Optical Society of America, 19, 1929, 1.*

Poor Wiring Imperils High Service Standards

"A LARGE amount of money is spent each year by utility companies to maintain constant voltage at the service entrance," stated R. J. Malcomson, manager lighting sales Public Service Company of Northern Illinois, recently, "but voltage at the service entrance is not the voltage that is of great moment. Voltage at the socket is the important consideration." Mr. Malcomson referred to a recent survey of the business and commercial districts of several Midwestern cities which disclosed that the voltage at the last socket was from five to ten volts less than the voltage at the entrance switch. This condition has been brought about by constantly adding small additional loads from time to time without considering the necessity of adding to the circuit capacity. Wire sizes that were probably loaded to capacity when they were installed have since been overloaded by the natural trend toward the use of higher intensity lamps.

Value of

Electrical Goods

Doubled in Eight Years

DURING 1927 the output of the electrical manufacturing industry in the United States was valued at $1,637,307,035, out of which sum it spent $336,238,750 in wages and $645,761,699 for materials, supplies, fuel and power; statistics are not collected on such other expenses as rent, taxes, insurance, advertising, interest on investment and allowance for depreciation. By the process of manufacture it added nearly a billion dollars ($991,545,336) to the value of the raw materials used. It employed 246,565 wage earners, or, in round numbers, a quarter million, and utilized an installation of prime movers, including motors driven on purchased energy, of 668,701 hp. This gives an average of 2.71 hp. per wage earner. The recently published preliminary figures issued by the Department of Commerce embodying these and other results of the Census of Manufactures for 1927 are summarized at greater length in the accompanying tables.

Comparison with figures for earlier years reveals increasing concentration in larger establishments, a continuous growth in value of product except during the disturbed period immediately following the war, a greater increase in wages than in number of wage earners and, in particular, a rapid advance in mechanization.

It was to be expected that, compared with 1914, all dollar values should be higher now than formerly; the gain, however, has been continuous even during the post-war period. Going only as far back as 1923, the value of products rose from $1,293,001,771 in that year to $1,540,002,041 in 1925 and to $1,637,307,035 in 1927. The ratios of increase are 19 and 6.3 per cent, respectively, for the two periods. During the entire thirteen-year period covered in Table I production measured in dollars, and disregarding the changing value of that unit, increased fivefold.

During the same four years the wages rose from $305,455,263 successively to $323,834,541 and to $336,238,750, corresponding to 6.0 and 3.8 per cent, while the thirteen-year period shows total wages in the industry about 4.5 times as great in 1927 as in 1914. In its relation to the final value of the product the expenditure for wages has not greatly varied, for it continues between one-fourth and one-fifth.

While the number of establishments has increased from 1,030 in 1914 to 1,777 in 1927, a rise of less than 75 per cent, the number of wage earners more than doubled and the horsepower was trebled. The average size of the establishments has therefore been growing larger, with a constantly increasing amount of power at the command of each worker. At the same time the average wage has trended steadily upward, uninterrupted even in 1921, when almost every other item shows a temporary decline. From the data in Table I it is found to be, for the six years there given, $625, $1,123, $1,204, $1,300, $1,350 and $1,360.

Table II brings out some general comparisons between 1927 and 1925. Every item shows an increase, with one exception. The only decrease is in the group designated as "other products, contract work, repairing." The first of these is the most important. It amounted to $97,645,-

Table II—The Electrical Manufacturing Industry in 1925 and 1927

	1925	1927	Per Cent Change
Number of establishments	1,739	1,777	2.2
Wage earners	239,921	246,565	2.8
Wages, dollars	323,834,541	336,238,750	3.8
Cost of materials, supplies, fuel and purchased power	$636,692,076	$645,761,699	1.4
Materials, supplies, containers		626,617,053	
Fuel and power		19,144,646	
Products, total value	$1,540,002,041	$1,637,307,035	6.3
Electrical machinery apparatus and supplies	1,435,470,008	1,551,816,138	8.1
Other products, contract work, repairing	104,532,033	85,490,897	—18.2
Value added by manufacture	903,309,965	991,545,336	9.8
Horsepower	589,398	668,701	13.5

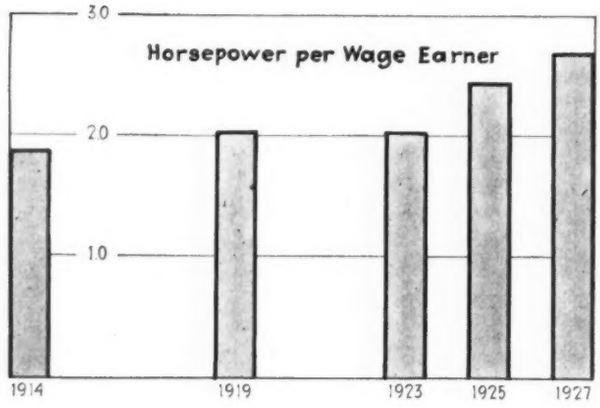
Table I—Thirteen Years' Growth in Electrical Manufacturing

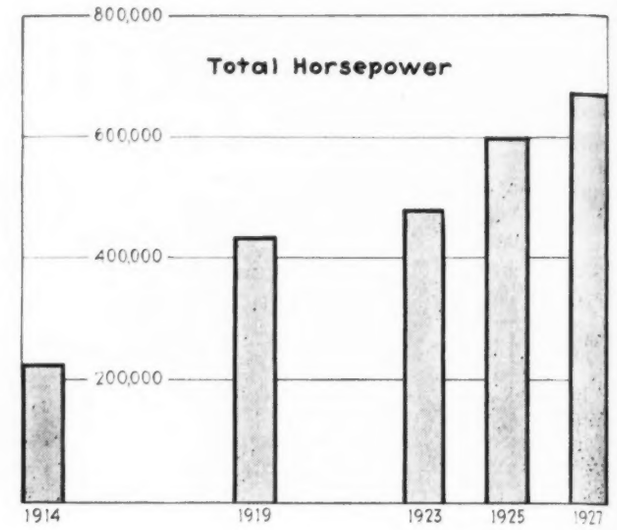
(From Census of Manufactures)

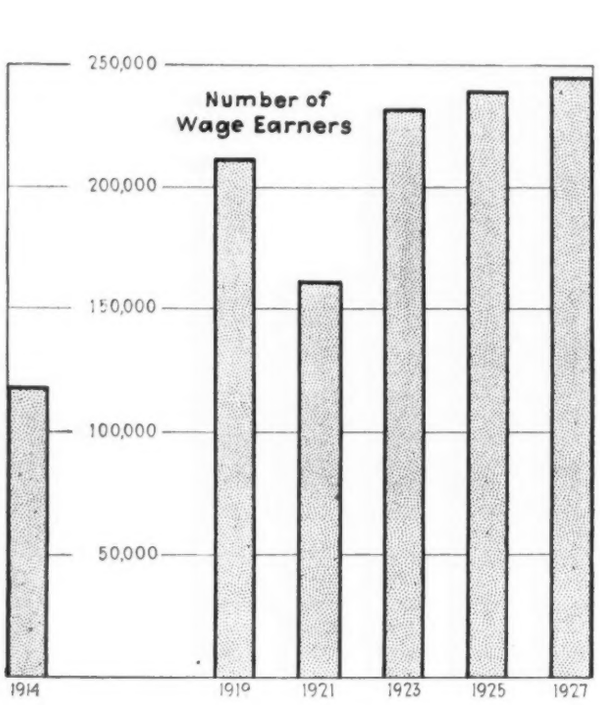
Year	Number of Establishments	Number of Wage Earners	Wages	Value of Products	Horsepower	Horsepower per Wage Earner
1914	1,030	118,078	$73,806,329	335,170,194	226,320	1.91
1919	1,404	212,374	238,188,852	997,968,119	438,082	2.06
1921	1,333	161,204	194,242,357	833,985,443	(No data)	
1923	1,671	234,892	305,455,263	1,293,001,771	480,268	2.05
1925	1,739	239,921	323,834,541	1,540,002,041	589,398	2.45
1927	1,777	246,565	336,238,750	1,637,307,035	668,701	2.71

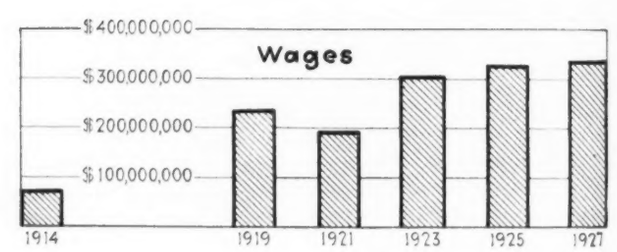
Electrical Manufactures Now Twice 1921 Value

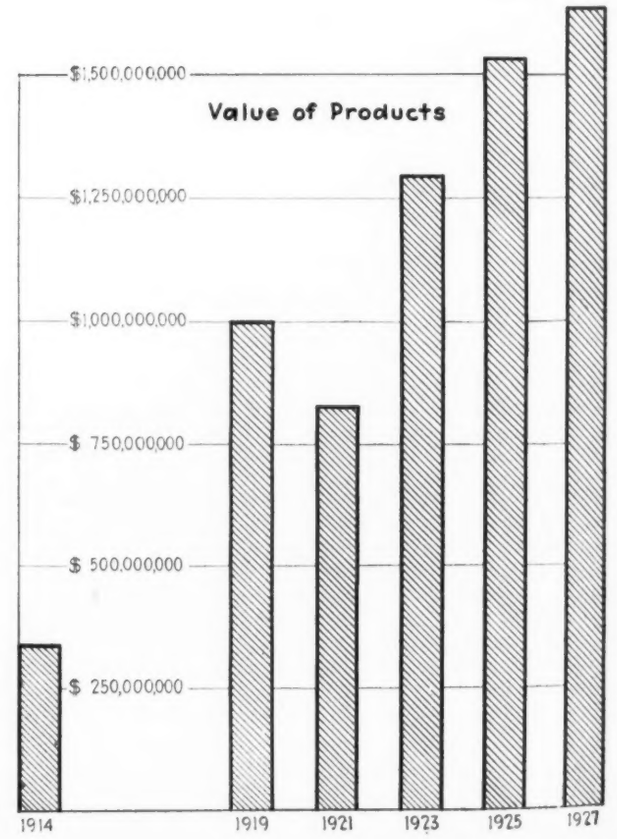
Power per wage earner growing much faster than workers or establishments











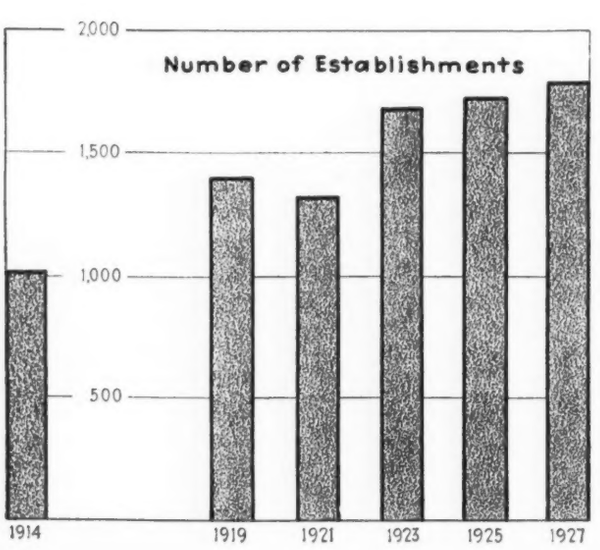


Table III—Value of Electrical Manufactures by Classes

	1925	1927	Per Cent Change
Total value	$1,540,002,041	$1,637,307,035	+ 6.3
Batteries	155,247,811	150,216,485	— 3.2
Control apparatus	31,302,841	33,869,615	+ 7.4
Fans	10,895,769	10,755,001	— 1.3
Generators, motor-generatorsets, automotive starting motors	110,185,015	115,179,671	+ 4.6
Household, heating and cooking appliances	75,102,165	72,933,274	— 2.8
Industrial apparatus and appliances	10,283,335	12,343,673	+12.0
Interior conduits and fittings	46,329,735	42,105,294	— 9.2
Lamp bulbs	73,558,210	87,933,204	+19.5
Instruments, relays, instrument transformers	31,650,355	34,009,999	+ 7.3
Motors (not incl. automotive starting), parts and supplies	113,109,577	122,146,337	+ 7.8
Radio apparatus and tubes	178,834,697	191,228,647	+ 7.0
Switchboards, breakers and switches	69,759,067	70,801,619	+ 1.5
Telephone and telegraph apparatus	84,432,662	119,271,904	+41.3
Transformers, regulators, reactors	62,153,155	66,611,334	+ 7.2
Wiring devices	34,806,452	32,216,698	— 7.3
Miscellaneous, including wire	347,819,162	390,193,383	+12.1
Other products	104,532,033	85,490,897	—18.2

406 in 1925. Its decrease indicates a diminution in non-electrical products of concerns that nevertheless are part of the electrical industry. Truly electrical products, not including the non-electrical work, were valued at $1,551,816,138 in 1927, or 8.1 per cent more than in 1925.

Significant of the persistent tendency to replace human effort by mechanical power is the 13.5 per cent increase, greater than for any other item of the summary, in the installed horsepower.

The output in terms of value as reported by the manufacturers is analyzed in Table III, and further data on major types of apparatus are given in Table IV. In the power field most items had a larger value in 1927 than in 1925, the maximum rate of gain being the 12 per cent increase in industrial apparatus and appliances, followed by motors, control apparatus and instruments with their accessories. Industrial control apparatus increased in both the direct current and the alternating current fields, the two together aggregating nearly $23,000,000 in value and comprising more than 577,000 units. From a comparison with the figures for motor production it is evident that control equipment is going in faster than new horsepower. In the absence of positive data the reasons can only be guessed at. Apparently more of the new motor installations have control than formerly, and probably some of the older ones are being so equipped. There is also other evidence of considerable replacement and, presumably, modernization. Exclusive of fractional horsepower machines, 5,145,822 hp. of motors is reported to have been manufactured during 1927. While data on the rate of motorization of the manufacturing industry during 1927 have not yet been published, it may tentatively be taken in round figures as

Table V—Location of Electrical Manufacturers

(Number of Establishments, by States)

	1927	1925		1927	1925
Total Number	1,777	1,739	Total Number	1927	1925
New York	298	334	Indiana	58	57
Illinois	258	236	Missouri	52	54
Ohio	206	205	Minnesota	29	28
New Jersey	137	142	Washington	25	24
Pennsylvania	136	133	Maryland	17	14
Massachusetts	122	116	Rhode Island	14	15
California	115	110	Kentucky	12	10
Connecticut	70	65	Texas	11	8
Wisconsin	65	55	Oregon	10	10
Michigan	60	53	West Virginia	10	7
			Sixteen other states	72	63

Table IV—Production of Some Major Types of Electrical Apparatus and Supplies

	1925	1927	Per Cent Change
A.-C. Industrial Control:			
Number	292,999	392,707	+ 34.3
Value	$11,873,307	$12,527,074	+ 5.5
D.-C. Industrial Control:			
Number		184,549	
Value	$7,933,480	$10,433,209	+ 31.5
A.-C. Turbo-Generators:			
Number	386	483	+ 24.1
Kilovolt-amperes	2,054,125	1,848,167	— 10.2
Value	$8,468,376	$8,741,001	+ 3.2
A.-C. Generators (other), Synchronous Condensers and Frequency Changers:			
Number	1,712	2,373	+ 38.5
Kilovolt-amperes	1,619,895	1,783,904	+ 10.1
Value	$9,431,072	$9,594,416	+ 1.7
Electric Ranges:			
Number	85,158	112,963	+ 32.6
Value	$6,776,963	$9,527,120	+ 40.5
Electric furnaces	$1,047,576	$2,281,348	+117.6
Industrial ovens	$746,645	$1,174,217	+ 36.4
Watt-hour Meters:			
Number	2,285,089	1,933,976	— 15.5
Value	$18,186,206	$16,547,034	— 8.8
Fractional Horsepower Motors:			
Number	2,288,348	3,039,563	+ 33.0
Value	$28,249,265	$33,831,708	+ 19.6

	1925	1927	Per Cent Change
D. C. Motors, 1 Hp. and Over			
Number	65,000	77,637	+ 19.4
Horsepower	628,044	635,130	+ 1.2
Value	$15,627,962	$15,796,626	+ 1.1
Induction Motors, 200 Hp. and Under:			
Number	289,916	355,140	+ 22.4
Horsepower		3,168,705	
Value	$34,908,246	$35,258,764	+ 1.0
Induction Motors, Over 200 Hp.:			
Number	1,246	1,233	— 1.0
Horsepower	464,316	444,380	— 4.3
Value	$2,713,797	$2,575,808	— 5.1
Synchronous Motors:			
Number	1,985	2,442	+ 23.0
Horsepower	931,514	636,692	— 31.6
Value	$5,309,331	$4,684,263	— 11.6
Oil circuit breakers*	$14,230,883	$17,891,246	+ 25.6
Air circuit breakers*	$2,596,599	$3,779,865	+ 45.5
Disconnecting switches	$3,643,281	$6,948,151	+ 90.6
Power Transformers:			
1—500 kva.	$28,766,327	$32,242,869	+ 12.0
Over 500 kva.	$20,233,698	$22,805,740	+ 12.7
Arrestors and choke coils	$5,961,111	$6,327,483	+ 6.2

*Not included in switchboard.

1,000,000 hp. per annum. This accounts for only 20 per cent of the production.

Only a fraction of the remaining 4,000,000 hp. can have been absorbed by new installations for mining, irrigation, agriculture, small shops and other uses not embraced in the Census of Manufactures. Most of it must have been used for replacements, as is to be expected in view of the fact that nearly 30,000,000 hp. of electric motors is now in use in industrial plants. And it seems that with these replacements came more industrial control.

The value of induction motors produced shows very little change from 1925, though there was some shift in sizes. Production of power transformers exceeded $50,000,000, rose more than 12 per cent in two years and surpassed the output of turbo-generators by more than five times in terms of value and four times in kilovolt-amperes. For the second time there is a decrease in the kilovolt-amperes of turbo-generators, but not in the value. Switching apparatus also increased notably.

Furnaces and Ovens Double

The decrease in household appliances is more than accounted for by a reduction in vacuum cleaners. This schedule was discussed in the Electrical World of April 20, 1929, on page 815.

Increased use of electric heating is reflected in several places: Ranges increased 40.5 per cent in value over 1925, approaching the $10,000,000 mark. Electric furnaces and industrial ovens taken together doubled in value.

Although electrical manufacturing establishments are scattered throughout the country they are naturally more numerous in the industrial states. According to Table V, one-sixth of them are in New York and one-seventh in Illinois. The tier of nine states from Massachusetts to Illinois, inclusive, contains 1299, or 73 per cent of the entire number.

New Lighting Business Costs 8 to 20 per Cent to Obtain

AT THE recent convention of the Illuminating Engineering Society, held in Philadelphia, several reports upon lighting service bureau activities were made in response to a questionnaire previously circulated.

H. H. Balkam, Brooklyn Edison Company—"We are willing to spend about 20 per cent of our estimated increase in revenue in order to obtain the increase. Decentralization of the lighting bureau is working out admirably. It should be a part of the new-business department."

J. F. Mayo, Consumers Power Company—"$50,000 a year in added revenue per man is considered a suitable 'measuring stick' to indicate to company officials the real accomplishments of the department. Our total operating cost for the past two years was:

	1927	1928
Average cost per kilowatt added	$5.34	$4.35
Average cost per kilowatt-hour added	0.004	0.0035
Average cost per dollar of revenue added	0.082	0.071

Our officials feel that 15 cents per dollar of revenue added is justified."

M. R. Rodger, Central Illinois Public Service Company—"The expenses of the lighting department, including only salary expenses, advertising and campaign costs, as compared with revenue as estimated, were:

	1925	1926	1927	1928
Expense	$13,670.00	$15,736.00	$20,600.00	$25,448.00
Revenue	19,593.72	36,870.00	43,878.55	99,094.92

F. C. Eteson, Virginia Electric & Power Company—"It has been found, in taking into consideration the personnel, space required for offices, advertising equipment and any other expenses, that every dollar invested in lighting service actually returns from $7 to $8 in new annual revenue, using an average of 4 cents per kilowatt-hour for added energy use."

R. B. Brown, Jr., Edison Electric Illuminating Company of Boston—"We are not concerned directly with costs of operating our lighting department. It is all included in the sales department budget and we have no way of telling how many dollars of revenue were produced per dollar expended. However, figures for the entire sales department indicate an expense of from $4 to $5 per kilowatt contracted. I rather feel such figures do not mean much, knowing that conditions continuously change and that we may be justified in spending much more money to obtain an added kilowatt of load at one time than at another."

A. A. Brainerd, Philadelphia Electric Company—"Since the primary business of any light or power company is the manufacture and sale of electric energy, any 'measuring stick' which will give a fair indication of the value of the department to the company should be based upon the profit to be derived from increased revenue. If an engineer sells 1,000 kw. of additional lighting load per year, a fair average assumption would be that the annual revenue therefrom is $60,000 on a basis of 1,500 burning hours a year, at an average rate of 4 cents per kilowatt-hour. Assuming that of this revenue 10 per cent represents net profit, the actual gain in revenue each year due to this engineer's service would be $6,000, and the capital value of his year's work would be equivalent to $120,000 invested in a sound security with an annual interest return of 5 per cent. If, after making due allowances for indirect results, we take 10 per cent of the annual added revenue due to the efforts of the lighting service department as the budget for expenditures for the coming year, in this activity, for the following year we would have a reasonable foundation for the development of the department."

Advertising with a Smile

god bles
our hom
JOHN HELD JR. ENG.
DONT SELL THE OLD FARM, FATHER
GIVE THE DARN THING AWAY!
"There's no use trying to sell the old homestead, Dad," argued Nellie, "nobody will buy it. If you only had let me follow the advice of that Home Service Specialist of The Boston Edison Company, and put in adequate electric lighting, we could have palmed off the old dump at a profit."
"You're right, me gal," growled the old curmudgeon . . . "next time we'll know better."
THE
EDISON ELECTRIC ILLUMINATING
COMPANY OF BOSTON

Selling adequate wiring and gaining publicity for home service specialists need not be a solemn and dignified rite. The Edison Electric Illuminating Company of Boston (of all places) has long done interesting things in advertising and continues to do so. A fig for solemnity and another for dignity! Here is a recent theater program ad which, with the connivance of John Held, Jr., drags business into the realm of flippant interest.

Promotional Problem of the
Electric Water Heater*

Appropriate rate for heater hinges on critical study of cost allocations

By H. GEORGE D. NUTTING
Sales Engineer Detroit Edison Company
Detroit, Mich.

MOST power company executives are much confused regarding electric water heaters. In the backs of their heads they are not sure that electric heaters are sufficiently economical to recommend to their customers and they hesitate to make "promotional rates" for fear that they might promote too much business and turn present valleys into future peaks, with consequent increases in capital investment costs.

Further, they can see no reason why they should make "class rates" to encourage this class of business. The writer is inclined to agree with this attitude. He believes that it is suicidal to pick out any particular appliance and make a special rate applying to it alone. A rate schedule should be so formed that appliances having high load factors, off-peak maximum demands and high power factors will automatically earn a rate consistent with the cost of serving them.

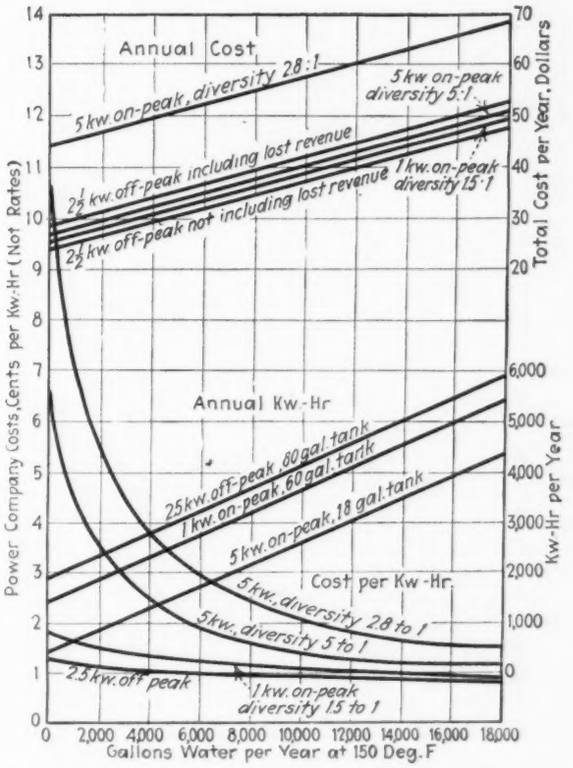
It is now quite generally accepted that rates should adhere fairly closely to the cost of service of certain widely defined classes of service, namely, residence lighting and small appliances, small power, large power, commercial lighting, street lighting and a few special classes like churches, water pumping, electric railway power, etc.

It is also generally agreed that the costs of service are made up of three main classifications of expense, namely, (1) fixed (capital) costs; (2) customer costs; (3) kilowatt-hour costs.

It must be assumed that the present rates of most power companies are the results of developments based upon experience. All we need to consider, therefore, is: (1) What rate will get the water heater business? (2) Will it be profitable to the utility? (3) In what form should it appear in the rate schedule?

WILL HEATER BUSINESS BE PROFITABLE?

Let us assume that the total useful investment in a power utility is $350 per kw. of diversified demand. In other words, the useful investment divided by the peak demand is $350. It will be found to be somewhere near this figure in many well-operated power companies. Let us further assume that 15 per cent is a fair overhead charge for interest, depreciation, taxes, etc. Then by simple arithmetic each kilowatt of demand on the system peak causes an annual fixed charge of 15 per cent of $350 = $52.50. If a 1-kw. water heater is placed on the lines and its full demand comes on the system peak the company has to meet a fixed capital expense of $52.50 per year to serve it.


Annual Cost
5 kw. on-peak, diversity 2.8:1
5 kw. on-peak diversity 5:1
2½ kw. off-peak including lost revenue
1 kw. on-peak diversity 1.5:1
2½ kw. off-peak not including lost revenue
Annual Kw.-Hr
25 kw. off-peak 80 gal. tank
1 kw. on-peak, 60 gal. tank
5 kw. on-peak, 18 gal. tank
Cost per Kw.-Hr.
5 kw., diversity 2.8 to 1
5 kw., diversity 5 to 1
2.5 kw. off peak
1 kw. on-peak diversity 1.5 to 1
Power Company Costs, Cents per Kw.-Hr (Not Rates)
Total Cost per Year, Dollars
Kw.-Hr per Year
Gallons Water per Year at 150 Deg. F
0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14
0 10 20 30 40 50 60 70
0 1,000 2,000 3,000 4,000 5,000 6,000

Cost of Delivering Water Heater Energy

Consumption and costs for three types of electric water heater installations, all giving the same service to the customers, based on,

$150 per kilowatt investment
15 per cent rate on investment
0.6 cent per kilowatt-hour (delivered)
$2 per year customer charge for on-peak
$5 per year customer charge for off-peak
$50 investment for off-peak metering and control.

In addition to this fixed expense is the cost of energy, which, of course, varies in different places, but which we may assume, for example, to be 6/10 cent per kilowatt-hour delivered at the customer's meter. Of course in some cases this will be 1 cent or more.

Now let us assume that this customer will use 250 kw.-hr. a month for six months out of the year and 100 kw.-hr. a month for the other six months, all for water heating. This amounts to 2,100 kw.-hr. a year, which at 6/10 cent each will cost $12.60. A further expense to the company will be the so-called "customer charge," which might add another $2 a year to the expense of service applicable to water heaters. We then have a total of about $67 a year for 2,100 kw.-hr., or 3.2 cents a kilowatt-hour.

It should be noted that the above figures apply to only one 1-kw. heater placed on the lines. If a large number,

*Second abstract of Mr. Nutting's paper "The Electric Water Heater," awarded the James H. McGraw second prize at N.E.L.A. convention, June, 1929. See October 12 issue for first abstract.

say 500 or more heaters, are put on, the diversity factor will be at least 1.5 to 1 and the demand charge per heater will be $35 instead of $52.50. The over-all yearly cost per heater will then be $49.60, or 2.36 cents per kilowatt-hour.

In order definitely to determine therefore what rate a given power company can profitably charge for water heating it is necessary to first determine:

1. What is the present and probable future investment cost per kilowatt of diversified demand?

2. What portion of this investment per kilowatt will be effected by increases in residence demand on system peak and on residence peak?

3. What is the diversity factor of electric water heating for both high-wattage and low-wattage installations?

In order to present to the reader a picture of the whole situation as to high or low wattage and as to on-peak or off-peak rates an example will be given. Let us assume we wish to install in an ordinary home with a family of four people an electric water heater to give automatic, continuous, reliable and satisfactory service. For equivalent service to the family we have the option of installing, either (1) a 1-kw., 60-gal. heater operating on peak, (2) a 5-kw., 18-gal. heater operating on peak, (3) a $2\frac{1}{2}$-kw., 80-gal. heater operating off peak (assume the off-peak period is ten hours).

Which heater will give the lowest cost per month to the customer and what profitable rate must the power company charge in each case?

Assume the use of hot water is 2,000 gal. a month at an average temperature of 150 deg., and that the electric heater furnishes all the hot water for six months and half of it for six months. First let us study the 1-kw., 60-gal. heater, which it is assumed will come on the system peak. Experience and tests show that this heater will use 560 kw.-hr. a month for the 2,000 gal. a month period and 340 kw.-hr. a month during the 1,000 gal. a month period. (Note that the losses are figured at an average of 120 kw.-hr. a month during both periods.)

Information available at this time indicates that connected loads of 1 kw. will give a diversity of 1.5 to 1. In other words, the summation of, say, 500 1-kw. loads will give a peak demand of $\frac{500}{1.5} = 333$ kw. and 1 kw. will contribute 0.67 kw. to the system peak demand. There is not sufficient data at hand to prove this figure absolutely, but for purposes of example the reader is asked to accept it for the time being.

The power company's cost of service will then be calculated as follows:

The increased investment in power house, and including some distribution capacity, will be about $150 per kilowatt of diversified peak demand. (See discussion of this figure later.)
The annual fixed charges will then be (for a 1-kw. heater):
$150 × 15 per cent × 0.67 kw. = $15.05
The annual kilowatt-hour charge will be:
Six months at 560 kw.-hr. = 3,360 kw.-hr.
Six months at 340 kw.-hr. = 2,040 kw.-hr.
Total for year = 5,400 kw.-hr. at 6/10 cent = $32.40

Annual customer charge (assuming heater is connected on regular lighting meter), say	$2.00
Total annual cost of service	$49.45
Average cost per month	$4.12

Average company cost per kilowatt-hour $\frac{\$49.45}{5{,}400 \text{ kw.-hr.}} = 0.915$ cent

Annual load factor based on connected load—

$$\frac{\text{kilowatt-hours used} = 5{,}400}{\text{kilowatt-hours connected } 1 \times 8{,}760} = 61.7 \text{ per cent}$$

Annual load factor based on

$$\text{Maximum demand} = \frac{5{,}400}{0.67 \times 8{,}760} = 92.2 \text{ per cent}$$

Now let us calculate the cost of serving a 5-kw., 18-gal. heater, giving the same service.

Tests made by the Detroit Edison Company indicate that the diversity of high-wattage heaters, based on the Monday peak, is 2.8 to 1. The tests are not final, but are based on the measured observation of four heaters for seventeen Mondays, and it is believed that further tests will show even better diversity than 2.8 to 1. For the purposes of our analysis we may assume that this diversity factor is reasonably correct.

The cost of service for this heater giving the same service as the aforementioned 1-kw. heater will be calculated as follows:

Fixed charges (annual):

$$\$150 \times 15 \text{ per cent} \times \frac{5 \text{ kw.}}{2.8} = \$40.20$$

Energy charges:

Less kilowatt-hours will be used than for the 60-gal. tank because the tank losses of this 18-gal. tank will not exceed 35 kw.-hr. a month, compared to 120 kw.-hr. a month for the 60-gal. unit.

The total kilowatt-hours per year for this heater will be:
Useful heat in water 18,000 gal. × 0.22 kw.-hr. = 3,960 kw.-hr.
Losses twelve months × 35 kw.-hr. = 420 kw.-hr.
Total kilowatt-hour per year = 4,380 kw.-hr.
at 6/10 cent = $26.28

Customer charge	2.00
Total annual cost of service	$68.48
Average cost per month	$5.71
Average cost per kilowatt-hour, cents	1.56

Annual load factor based on connected load

$$\frac{4{,}380}{5 \times 8{,}760} = 10 \text{ per cent}$$

Annual load factor based on individual heater's contribution to the system peak

$$= \frac{4{,}380}{\frac{5 \times 8{,}760}{2.8}} = 28.1 \text{ per cent}$$

Now let us see what the cost of service of the $2\frac{1}{2}$-kw., 80-gal. heater is, when operated off peak.

It is necessary to power this heater with a $2\frac{1}{2}$-kw. element to be sure that it will regenerate completely in the off-peak time usually available (about ten hours). It takes 2 kw. per hour for ten hours to regenerate 80 gal., 100 deg. temperature rise, so this $2\frac{1}{2}$-kw. element leaves $\frac{1}{2}$ kw. capacity to spare.

Investigation of the power house capacity released for ten hours (off peak) in one power company revealed the fact that about 30 per cent of the residence customers could be equipped with these $2\frac{1}{2}$-kw. heaters without making any investment whatever in increased facilities to serve them. The writer believes it is safe to assume that this type of heater need never be charged with fixed capital charges so far as plant equipment is concerned, except, possibly, for "class responsibility." This type does, however, introduce an element of fixed charges in control and metering equipment.

To install a good clock and meter will cost in the vicinity of $50. Our cost of service per year will then be as follows:

Fixed Charges:
15 per cent of $50 = $7.50

Kilowatt-Hour Charges:

More kilowatt-hour will be used than by either of the previous methods. The losses of the 80-gal. tank will be about 160 kw.-hr. a month. The annual kilowatt-hours will therefore be:

Useful heat in the water—	
18,000 gal. × 0.22	3,960 kw.-hr.
Losses 160 × 12	1,920 kw.-hr.
Total annual kilowatt-hours	5,880 kw.-hr.

Annual kilowatt-hour cost is 5,880 kw.-hr. at 6/10 cent = 35.28.

This will be higher than for the other types because of the cost of maintenance of the clock and meter and because of the necessity for extra billing, etc. The writer believes this item should be about $5; total cost of service, $47.78; average cost per month, $3.98; average cost per kilowatt-hour, cent, 0.812. Annual load factor based on connected load =

$$\frac{5{,}880}{2.5 \times 8{,}760} = 26.8 \text{ per cent}$$

Annual load factor based on diversified maximum demand =

$$\frac{5{,}880}{\frac{2.5 \times 8{,}760}{2}} = 53.6 \text{ per cent.}$$

(Assuming diversity factor 2 to 1)

A very important consideration in connection with this off-peak installation is this:

A low rate cannot be advisedly made to apply to water heaters only, without permitting all other "connected" load to be thrown onto the off-peak meter during the off-peak period.

Attention is called to the fact that in the previous discussions we have referred to power company cost figures and their effect on customers' bills, as if they were also rates. The next question is,

What Should the Rates Be?

On account of many contingencies and uncertainties it would not be wise to offer the exact costs developed in the foregoing discussion in the rate schedule. An addition of from 10 per cent to 20 per cent all along the line is advisable. For example, an addition of 20 per cent to the cost per kilowatt-hour, shown in the accompanying illustration for the 1-kw. heater heating 10,000 gal. a year, would give a rate of 1.1 × 1.2 cent = 1.32 cent per kilowatt-hour.

For the same use the 5-kw. heater rate would be 2.1 cents x 1.2 = 2.52 cents per kilowatt-hour.

The customer's annual bill for the 1-kw. heater would be 1.32 cents × 3,650 kw.-hr. = $41.70 ($3.47 a month) and for the 5-kw. heater 2.52 cents × 2,600 kw.-hr. = $65.60 ($5.47 a month).

The rate schedule problem presented by an inspection of the cost curves shown in the illustration is no new problem. It simply again shows the load factor as the important element of the cost of service.

So far as the 1-kw. heater is concerned a flat 1½ cent rate could be added as a step in the residence rate schedule at a point beyond, say, 100 hours' use of the present demand. With some power companies this might be as low as 60 hours' use and with others it might run up to 150 hours' use of the demand.

The principal difficulty is in finding a way to curtail the use of 5-kw. heaters at low load factor or charge them a proper rate if they are used. Inasmuch as the water heater alone is likely to be the appliance that both demands and affords the opportunity for the low step in the rate after about 100 hours' use of the demand in residences, the following forms of rate schedule are suggested.

When the load factor type of rate is used a schedule might read:

10 cents per kilowatt-hour for the first step.
6 cents per kilowatt-hour for the second step.
3 cents per kilowatt-hour for use over the first and second steps where no heater or where a 4-kw. or 5-kw. water heater is installed, or
2¼ cents per kilowatt-hour for all over the first and second steps where a 2-kw. or 3-kw. water heater is installed, or
1½ cents per kilowatt-hour for all over the first and second steps where less than a 2-kw. water heater is installed.

Manifestly this calls for service inspection; but it is believed that few water heaters will be installed without the power company's knowledge, inasmuch as customers usually inquire of the power company before they install a water heater. Further, this rate is arranged so that the power company receives the highest third step until its attention is called to the fact that a customer has less than a 4-kw. or 5-kw. heater. The first or second monthly bill will usually suffice to direct attention to the element capacity of the water heater.

The "steps" above referred to may be based upon hours' use of active load, number of rooms, area or any other basis already adopted by the power company. Where it is desired to put the water heater on a separate meter (on peak) and make a special rate, the above-mentioned third step rates plus ¼ cent per kilowatt-hour for extra customer charges will cover.

Before leaving this phase of the subject the reader is reminded that the above rate figures are based on the following constants:

$150 investment per diversified kilowatt on the system peak.
15 per cent of the above $150 for annual capital charge.
6/10 cent per kilowatt-hour delivered at the customer's meter.
$2 per customer per year for operating overhead.

In those companies where these constants are different, the rates should be adjusted accordingly.

Importance of Diversity Factor

In all of the foregoing calculations it has been assumed that the system peak comes on washday and that the diversity factor of the 1-kw. low-wattage heaters is 1.5 to 1 and of the 5-kw. high-wattage heaters 2.8 to 1. If the system peak comes some other day than washday, and it usually does, the diversity factor of the 5-kw. heaters can be close to 5 to 1. The cost of service per annual kilowatt-hour and customer's annual bill are also shown in the accompanying illustration for this 5 to 1 diversity.

The basic calculations for one point on the curve are as follows:

Fixed Costs

$$\$150 \times 15 \text{ per cent} \times \frac{5 \text{ kw.}}{5} = \$22.50$$

Energy costs for 18,000 gal. a year
4,380 kw.-hr. at 6/10 cent = $26.28
Customer costs $2.00

Total annual costs $50.78

$$\text{Cost per kilowatt-hour} = \frac{50.78}{4{,}380} = 1.16 \text{ cents.}$$

Inspection of the figure shows this cost still to be higher than for the low-wattage heater, but only slightly so.

"Progress is the increasing share of more people in the good things of life."

"Organized industry is the chief instrument of progress today and the electrical industry is the keystone in the arch of our life."

"Demagoguery in leadership is still steeped in the idea that whoever has anything must have stolen it!"

"The vital question before humanity is, how shall the masses of men escape from poverty? . . . We turn to the service of the electrical industry as we seek the answer and the future is bright with promise."

—Adapted from an address by Dr. Charles A. Eaton *before the New England Division, N.E.L.A.*

Annealing Costs Predetermined*

ASSUME a production of 10 tons of miscellaneous steel castings per day to be annealed at 1,650 deg. F. in a car bottom furnace, one charge per day, an efficiency of loading 180 lb. per cubic foot, and that the heating cycle is as follows:

Charge loaded on cold car is placed in furnace at 5 p.m., approximately eight hours to heat, four hours soaking, and cooling in furnace for the remainder of the 24 hours.

The actual loading space required is $\frac{20{,}000}{180}$ lb. = 111 cu.ft.

A furnace having a car 4 ft. 6 in. wide × 12 ft. long and door opening 3 ft. high will meet the requirements.

1. Absorption of castings:

$$\frac{20{,}000 \times 0.16 \times 1{,}580}{3{,}412} = 1{,}480 \text{ kw.-hr.}$$

2. Absorption of car:

Assume the car is bricked with 4½ in. of fire brick and 7½ in. of insulation. From tests it has been determined that the firebrick will be heated to an average temperature of about 1,200 deg. F.

Total weight of fire brick in car is approximately 3,000 lb. Therefore, $\frac{3{,}000 \times 0.22}{3{,}412} = 232$ kw.-hr. absorption of car. The small amount of heat absorbed by the insulation is negligible.

Since the charge is cooled in the furnace for approximately twelve hours it is necessary to know the temperature of the furnace at end of the cooling period, so as to determine the amount of heat to be supplied to heat the furnace walls.

Knowing the inside area of furnace, construction of furnace and weight of charge, the cooling curve can be calculated.

From the inside area the stand-by losses for any temperature can be determined, also the amount of heat given up by walls and charges in cooling can be determined. Knowing these two factors, the cooling curve can be tabulated.

The inside area is 255 sq.ft.

Therefore, stand-by losses at 1,650 deg. F. = $\frac{255 \times 1{,}650}{1{,}000}$ = 42 kw.-hr. per hour.

Absorption of furnace:

If the furnace is lined with 4½ in. of fire brick weighing 140 lb. per cubic foot, the total weight of furnace lining is:

$$255 \times \frac{4.5}{12} \times 140 = 13{,}400 \text{ lb. of fire clay.}$$

$\frac{13{,}400 \times 0.22 \times 50}{3{,}412}$ = 43 kw.-hr. given up by walls in cooling 50 deg. F.

$\frac{20{,}000 \times 16 \times 50}{3{,}412}$ = 47 kw.-hr. given up by charge in cooling 150 deg. F.

43 plus 47 = 90 kw.-hr. to be radiated from furnace in cooling 50 deg. F.

From the data we can approximate the cooling curve as follows:

Temperature, Deg. F.	Heat Given Up by Charge and Furnace in Cooling 50 Deg. F.	Stand-By Losses	Hours to Cool 50 Deg. F.
1,650	90	42	2.1
1,600	90	41	2.2
1,550	90	40	2.3
1,500	90	38	2.4
1,450	90	37	2.5
1,400	90	36	2.5
Total			14.0

From this data the furnace will cool to 1,400 deg. F. in fourteen hours.

Due to the fact that the furnace during the annealing period is not held at temperature long enough thoroughly to soak the furnace wall, the cooling rate during the first few hours will be greater than shown above. Taking this into consideration, we can safely assume that the furnace will cool to 1,400 deg. F. in twelve hours.

The absorption of the car has already been determined, therefore the area of the car is eliminated in calculating.

Absorption of wall:

Inside area of furnace less area of car, 200 sq.ft.

$$200 \times \frac{4.5}{12} \times 140 = 10{,}500 \text{ lb. of fire clay to be heated.}$$

Since the walls will not be thoroughly heated during the time required for annealing, the approximate temperature rise of the fire clay will be (1,650 — 1,400) × 0.8 = 200 deg. F. Therefore, $\frac{10{,}500 \times 0.22 \times 200}{3{,}412}$ = 136 kw.-hr. absorption of walls.

SUMMARY OF HEAT REQUIREMENTS

	Kw.-Hr.
Absorption of castings	= 1,480
Absorption of car	= 232
Absorption of furnace walls	= 136
Total stand-by losses for twelve hours' heating period (at 1,550 deg. F., average temperature)	= 480
Losses during interchange of charges	= 75
Total power consumption	= 2,403

*As indicated in a paper, "Calculation and Operating Costs of Electric Furnaces," presented by R. M. Cherry of the General Electric Company at the Industrial Electric Heating School, Case School of Applied Science, Cleveland, Ohio.

Steel Castings Annealing Furnace

General Electric car-bottom tunnel-type furnace, rated 240 kw., three phase, 220 volts, 12x3x4½ ft.

Economy $\frac{2,403}{10} = 240$ kw.-hr. per ton.

The losses during interchange of charges will of course depend upon the time required to remove the hot car and place new charge in furnace.

The furnace rating required is equal to the $\frac{\text{total heat absorption}}{\text{hours for heating}}$ = plus losses per hour. Furnace rating $= \frac{1,480 \text{ plus } 232}{8}$ plus 42 = 256 kw. approximately.

An actual test on this size of furnace on approximately the same cycle gave the following results:

Heat No.	Weight of Casting	Total Kw.-Hr.	Kw.-Hr. per Ton
1	22,570	2,640	234
2	21,152	2,630	249

If this furnace operated continuously; that is, two 10-ton charges per day, castings being removed immediately after soaking period, the economy would be:

	Kw.-Hr.
Absorption of castings per charge	= 1,480
Absorption of car	= 232
Total loss for twelve hours	= 480
Assume interchange or charges	= 75
Total power consumption	= 2,267

Economy, 227 kw.-hr. per ton.

Letters from Our Readers

Considers Cells Essential for Oil Breakers

To the Editor of the ELECTRICAL WORLD:

I noticed an editorial in the July 27 issue of the ELECTRICAL WORLD, under the heading "Why Cells for Oil Circuit Breakers?" and would like to make the following comments on this article:

I quite agree that indoor circuit breaker failures are extremely infrequent; at least such is the case here at the Kansas City Power & Light Company. The reason that we have been installing concrete barriers is to provide phase barriers around the disconnects which are used in conjunction with the circuit breakers. In this manner we hope to limit the fault to a phase to ground and prevent the development of a phase to phase short. It is possible that the steel cubicles can do this just as efficiently as the concrete. However, we find that the installation will be more costly.

We have had two or three cases of insulator flashovers in our substations, which are non-attendant; in one case the disconnect flashed over, and while this flash damaged the porcelain to some extent and there were a number of burned marks on the barrier doors and cell structure, yet the circuit was put back into operation and the trouble found the next day when an inspector went into this station. In another case the bushings of a 15,000-volt oil circuit breaker flashed over to the case and the extent of the burns on the barriers and doors indicated that had this not been confined to a barrier it would undoubtedly have caused a three-phase short. This switch was used on a 13,200-volt system and has flashed over a number of times during lightning storms. The damage so far has consisted only in a momentary interruption to the service and slight burns on the metal work of the switch. The circuit has always gone back into service automatically after this interruption. It is, therefore, my belief that the concrete or masonry barrier still does have a legitimate use in the modern station.

We have recently checked up the cost of a proposed substation using steel cubicles and also using Alberene stone barriers on a steel framework. In both cases we have found that the proposed installation would be approximately 15 per cent to 20 per cent higher than if we used concrete.

I would like to know whether any comparative costs are available covering similar types of installation so that I may check the estimates which I have been furnished. I will say, with reference to concrete barriers, that it is extremely difficult to produce a finished looking job, since it is considerably more work to dress up the concrete after the forms have been stripped in order to remove form marks and other irregularities.

G. O. BROWN,
Supervisor Engineering and Construction Departments.
Kansas City Power & Light Company,
Kansas City, Mo.

Tests on Paper Cables

To the Editor of the ELECTRICAL WORLD:

The article in the ELECTRICAL WORLD of August 10 by Raymond D. Sherman reveals the fact that in several cable factories there was considerable difficulty in getting the cable ends to stand up to the test voltages without flashing over.

We should like to bring to the notice of these companies, and of your readers generally, a method of improving the flashover of testing ends, which consists of applying a layer of semi-conducting material extending about a third of the distance from the termination of the lead casing to the bared conductor at the end of the cable (British Patent 290401. Patents in other countries pending). This material, if correctly applied, will enable voltages of 50-60 kv. to be run on ends which are only trimmed back for 12 in. and will permit of test voltages of 100 kv. being applied in air without the trouble of fitting up special terminal bushings. It can also be applied to such bushings to increase the flashover voltage.

For a fuller technical treatise on the subject we would refer to the *I.E.E. Journal*, Vol. 66, No. 382, October, 1928, and to pamphlet 175-A.

We shall be pleased to send copies of these to engineers interested in conducting such tests on request.

Siemens Brothers & Company, Ltd., H. GURNEY WOOD.
London, England.

John Brown—A Citizen

To the Editor of the ELECTRICAL WORLD:

John Brown, average American home owner, has his own car and radio, goes to the movies, reads magazines, receives electric and gas service and lives his life touched by the butcher, baker and public utility man. He is an ordinary citizen. What does he care about the ideals of the magnates of the movie industry? What, when buying his new car, does he think of the industrial policy of the motor car makers or their obligation to the public? What does he believe to be the truth about the utilities?

John Brown's electric service comes to him without annoyance. The lights don't flicker. They don't go off at intervals and leave the house in darkness and the dinner half-cooked. The bills come and are paid. Every once in a while some young man comes up to the house and sells Mrs. Brown a new appliance, but it doesn't seem to send the bill up by leaps and bounds. When he calls for the service man things happen pretty quick. What does John think about his local electric light and

power company? Nothing in particular; they have polite clerks and he is treated fairly and he is not annoyed by them. He believes they are running a good business and are helping build the community.

But John Brown reads the newspapers and has a natural curiosity about big business. He wants to know about the big food mergers, the consolidation of stores into chains, the development of utility holding companies. He finds this kind of news interesting and, in a sense, has a suspicion about the ultimate effect on his grocery and light bills. For example, he reads reports of the Federal Trade investigation in Washington. "I wonder what this utility propaganda in the schools is for?" thinks John. "They must be trying to hide something. They talk so much they must be trying to conceal something in words." Then there was that meeting at the town hall last spring when the president of a foreign utility company was there under the auspices of the civic club—the general idea was to justify what the industry had done. "Nice fellow, that president," says John. "But I don't see any need for the power company to assume such a heavy responsibility for the progress of civilization. He gave me the impression of a lawyer pleading to a jury. Why all the hubbub?"

Then there is one thing that John would like to know. It bothers him a lot. How do the utility companies make so much money if they are regulated as to earnings? He happens to read about some of the gyrations in the stock exchange prices and learns of split-ups, combinations, mergers, new holding companies and investment trusts. He and his friends made a little out of one merger. "That's the racket," says John. "They are kidding the public along to cover the money-grabbing in Wall Street." And there the case rests. John does not give a solitary whoop in perdition about industry ideals, ideas or objectives. There is doubtless no reason why he should. But if the industry could make him understand the complicated utility finance that is everywhere evident, accustom him to a large industry on as perfected a basis as is the telephone company and keep misleading headlines out of the papers, John will be as friendly and uncritical as you please. And talk to him very tactfully, if at all, about the benefits, economies and virtues of mergers and holding companies; he has heard all that—he does not want to feel under obligation to an industry and mistrusts those who attempt to force his education down his throat.

A Friend of the Industry.

"Circuit Breakers Without Oil"

To the Editor of the Electrical World:

The editorial under the above title which appeared in the August 24 issue of the Electrical World refers to three promising circuit breakers operating without oil. We would remind your readers, however, that this association also has developed, as a result of extensive research, a form of circuit breaker without oil. A description of this breaker, together with some accounts of the researches which have led to its development, was given in a paper read before the Institution of Electrical Engineers in London in December, 1928, and published in the *Journal* of that Institution in May, 1929. You were good enough to refer favorably to this work in an editorial entitled "The Phenomena of Circuit Interruption" in your issue of January 19.

Our gas blast circuit breaker was the subject of a patent (British patent No. 278,764) which was filed on September 28, 1926, from which it will be seen that our invention preceded the German air switch.

E. B. Wedmore,
Director and Secretary.

The British Electrical and Allied Industries Research Association, 36 and 38, Kingsway, London, W.C.2.

Possibility of Drawing Wrong Inference

To the Editor of the Electrical World:

Permit me to call attention to the article which appeared on page 680 of the October 5 issue of the Electrical World on the subject of "Costs of High-Pressure Units." The casual reader would draw the inference from this article that the Toronto station was more costly than the new Deepwater station because of the fact that in the former station only 400 lb. pressure was used, as against 1,400 lb. in the newer station.

Reference to the original article from which your figures were obtained would show that the writers did not intend that this inference should be drawn, as they end their article with the following statement:

> These studies and other studies lead us to the belief that a 1,400-lb. plant should cost not to exceed 5 per cent more than a 400-lb. pressure plant.

A perusal of the figures given will also show that the Toronto plant is no more costly because of pressure conditions. The first five items of the table should be eliminated as having no bearing on the subject, with the possible exception of foundations, and the effect in this case should be so slight as to be negligible.

Summing up the next four items in each column, we find that the cost of building, piping, boiler room equipment and turbine room equipment for the Toronto station amounts to $65.41, whereas the cost for similar items in Deepwater station amounts to $67.55. There is, therefore, a difference of $2.14 per kilowatt on the items which might be affected by pressure conditions.

The item of coal handling might be affected, inasmuch as the amount of coal required would be less in the case of the more efficient plant. However, the reduction would be small, and the probabilities are that it would result in no reduction of this item, as the coal-handling capacity is generally so much in excess of the real requirements that it is likely the same equipment would be installed in each case.

Steam pressure has certainly no bearing on electrical equipment.

The item of service equipment is undoubtedly affected by pressure, but without details of the equipment in this plant it is impossible to state what effect pressure would have on this item. However, it would increase the excess figure of $2.14 per kilowatt.

On the face of the figures presented it is, therefore, evident that the cost of the steam equipment at Toronto station is lower than that at Deepwater.

A study of the prime movers committee report on higher steam pressures and temperatures shows that all the companies which have built or are building high-pressure stations admit that the cost will run in excess of the 400-lb. stations, varying from $5 to $8.81.

I do not believe that any designing engineer claims today that a high-pressure installation can be made at a lower investment cost than for 400 lb. As the use of high-pressure equipment increases, naturally the cost will decrease, but that time has not arrived yet.

John H. Lawrence,
President.

Thomas E. Murray, Inc.,
New York City.

Digest of Electrical Literature

Heat Applications and Material Handling

Progress in Electric Furnaces for Non-Ferrous Metals.—M. TAMA.—The author has endeavored to marshal the latest developments in the sphere of non-ferrous metal melting and has devoted special attention to types of furnaces of particular interest in metallurgy, namely, the melting furnace and the annealing furnace. A number of desirable characteristics in the matter of design and performance have been indicated and specific examples pointed out showing how certain difficulties were overcome and performances improved. Consumption factors have been included. The only furnaces discussed in this paper are those utilizing indirect resistance heating, but the author recognizes the advantages of the induction type of furnace and has indicated just what he estimates their several merits to be. — *Engineering (England)*, September 20, 1929.

Transmission, Substations and Distribution

Self-Contained (FOT Type) Transformers.—K. THIEN.—In those installations where forced-oil-cooling (FOT type) transformers are given preference over standard water-cooled types with cooling coil within the tank, long pipe lines between transformer, circulating pump and cooling unit are common practice. Valves and joints, representing potential oil leaks, are then unavoidable. An Austrian concern devised a compact cooling outfit of this type which is installed directly upon the truck of the transformer, the whole equipment forming one self-contained unit. The cooler is horizontally arranged, but is slightly off level to be self-draining, which forestalls bursting in case of idle transformer and freezing temperature. Attendance and cleaning are readily possible, if necessary, even during operation of the transformer. — *Elektrotechnik und Maschinenbau*, September 8, 1929.

Operating Experiences with Austrian 100-Kv. Equipment. — J. SCHLÖGEL. — The record-breaking winter of 1928-1929, followed by a summer with an unusual number of storms, affected the many Austrian 100-kv. transmission lines remarkably little. The author has collected data and analyzed the few outages which occurred during these seasons. Due to the extreme cold of minus 30 deg. F. some pin type porcelains, supporting busbars, cracked and broke down. A flexible connection between bars and insulators was introduced to prevent a repetition of this fault. Excessive sleet covering, reaching more than ten times the diameter of the conductor, was responsible for ruptures on high-lines. One station near a particularly exposed stretch of line has installed a thawing transformer, which melts the sleet on a 20-mile line (shorted at the other end) within one-half hour. Crystallization of a few bronze castings on line hardware was responsible for breakage. Only first-class, fine grain bronze will be used in future, but the author advocates heavily zinc-coated steel parts. The cold caused also the cracking of a few metal bushing caps on inverted disconnects. The lightning disturbances were minimized by extensive use of arcing ground transformers, selective relays and current limitors. Of greatest value during all periods of emergency was found the carrier-current telephone, which functioned excellently when all other means of communication failed. Important orders were even given over a broken down high-line. — *Elektrotechnik und Maschinenbau*, September 8, 1929.

Hydro-Electric Development and Steam Equipment

Propeller-Turbine Set at Forshuvudforsen, Sweden.—The opportunity to compare under closely related conditions the performances and characteristics of Francis and propeller type turbines is afforded at the Forshuvudforsen plant. A full description of the power plant and of the results obtained has been included. The electrical end has also been described indicating modern design practices in Swedish work.—*Engineering (England)*, September 20, 1929.

Motors and Control

Ball and Roller Bearings for Motors. —F. UNGER. — While the inherent advantages of electric motors with ball and roller bearings are undisputed, the writer cites numerous examples of marketed motors with such bearings where the customary construction is not fully satisfactory, because in case of an armature repair the bearings must in practically all designs be disassembled. This is not only difficult but is liable to lead to a damage by the average repair man, who is not fully familiar with the somewhat intricate and delicate nature of such bearings. To overcome this difficulty the author presents several solutions of how to build ball bearings in such a way as to remove the armature with the bearings left undisturbed on the shaft. The article is illustrated with twenty drawings, indicating how bearings of this type should and should not be designed. — *Elektrotechnische Zeitschrift*, September 12, 1929.

Traction

Induction Versus Commutator Locomotive Motor. — B. GERSTMAN. — For years past electric traction engineers have discussed the pros and cons of direct-current and alternating-current systems and up to a few years ago Germany, Austria and Switzerland appeared to be about the only large countries to adopt uniformly the alternating-current system. Lately opinions have been changing again, as is indicated particularly plainly on the 1,000-mile alternating-current electrification of the Virginia Railways. Considering alternating-current electrification and eliminating the inherently less satisfactory and more costly three-phase roads the author investigates the comparative features of single-phase induction motors and single-phase commutator motors, or, as he terms them, the essentially synchronous and essentially asynchronous motor. Since the formerly much-used rod drive has lately been superseded by the mechanically more reliable individual axle drive the higher speed motor is now given preference. The author describes the features of these two motor types and comes to the conclusion that, unless some radically new motor construction should be evolved, the single-phase commutator motor with one motor per driven axle represents today and probably for the future the best and most economical solution. — *Elektrotechnik und Maschinenbau*, September 1, 1929.

Telegraphy, Telephony, Radio and Signals

Standing Electric Oscillations on a Line Excited at a Point Near Its Current or Potential Loop and Generation of Rotary Waves.—EIJIRO TAKAGISHI and EIJI ISO.—An account of both experimental and theoretical investigations involving a line structure energized with a high-frequency current of a known frequency through a single feeding conductor at a single point on the line. The authors have pointed out that the line currents on both sides of the feeding point as well as the feeding current itself are subject to a considerable variation not only in their magnitudes but also in their phase relations according to the displacement of the feeding point along the line. It is thus possible to convert the phase of a given oscillation current to any other phase relation. When the line conductor is built exactly or closely to the frequency of the exciting source the case becomes similar and the most important one to be applied in practice. In order to illustrate the phenomena involved in practical application the authors have considered unidirectional transmission of electric waves, unidirectional reception of electric waves, generation of polyphase oscillation and radiation of rotary waves or circularly polarized waves, and reception of rotary waves.—*No. 265, Researches Electrotechnical Laboratory (Japan)*, 1929.

News of the Industry

Electricity Triumphs on Edison Day

All Over the Nation and in Other Countries as Well Celebrations of the Semi-Centennial of the Incandescent Light Meet with Enthusiastic Participation

EDISON DAY—Monday, October 21—went over with a bang. Elsewhere is printed and pictured an account of the celebration at Dearborn, Mich., which five hundred fortunate individuals witnessed on the spot and to the audible part of which twenty thousand times that number "listened in." Dearborn was, however, merely the reserved grand stand in a continental amphitheater of which Eastport and Key West, San Diego and Bellingham were the national geographic corners, though the arena itself spread far beyond international boundaries, even Europe and South America not finding their distance from its center a bar to participation.

To recount in even bare outline all that went on in the ten or twelve metropolitan communities of the United States, in the scores of sizable cities that tread just behind them in the race for growth, and in the thousands of wide-awake small cities and towns would manifestly require a whole issue of the ELECTRICAL WORLD. It would not be possible even to "hit the high spots"—these were too many. Almost everywhere white ways became golden ways for the day or the week. Almost everywhere floodlighting and searchlights and widespread illumination in stores and residences added to the effect, electric light and power buildings standing out in special radiance. In many places there were parades with floats and tableaus designed to recall old times. Music and oratory filled the air, flags waved, airships circled, while from store windows, from the covers of hundreds of periodicals and from the pages of newspapers big and little the strong features of Edison — now probably better known in America than those of any save two or three among living men—met the gaze.

If "Light's Golden Jubilee" may without disrespect be called a thousand-ringed circus, an omnipresent reporter might among the multitudinous performances that made it up have noted as typical a few such as those that follow.

IN EDISON'S HOME STATE

The noteworthy observance at Menlo Park, N. J., is described on page 826. Other places in New Jersey entered heartily into the spirit of the day. Two hundred and fifty men and women assembled at an Edison dinner in the Hotel Plaza, Jersey City. In Newark a special jubilee luncheon was given by the Chamber of Commerce, addressed by Vice-President John L. O'Toole of the Public Service Electric & Gas Company. Every room in Nassau Hall at Princeton was ablaze from 6 p.m. to midnight. In Atlantic City a jubilee dinner and fifteen minutes' darkness on part of the Boardwalk called attention

Port Huron's Coming Memorial

to what electric lighting means. In the Oranges, where a spectacular pageant had on the Friday before seen the famous citizen off for Dearborn, special exercises were held in the schools.

IN THE NATION AT LARGE

In New York City Broadway from Thirty-fourth Street to Columbus Circle was transformed into a "golden way" by the New York Edison Company, while in Fifth Avenue also special gold lights commemorated the event. A notable outdoor display in honor of Edison, contributed by the General Outdoor Advertising Company, took the form of a huge electric sign at Broadway and Forty-third Street, bearing the inscription: "Light's Golden Jubilee, 1879-1929." It was switched on by Dr. John A. Harriss, president of the Broadway Association, with an appropriate program.

At the jubilee luncheon in the Hotel Astor, arranged by the Broadway Association, Dr. Julius Klein, Assistant Secretary of Commerce, spoke on lighting as an aid to trade and to commerce.

Philadelphia Parkway, from City Hall to the Art Museum, was a flood of light through which several thousand policemen and firemen paraded. Twelve 50,000-cp. searchlamps threw golden light upon the fountain in Logan Circle, while further on, in front of the museum, 90 golden and 10 silver searchlights were directed upon the paraders as they circled the Washington Monument. More than twenty bands combined to give a concert at the museum, where Mayor Mackey spoke, and an airplane, decorated with lights and visible to thousands on the streets, took off from the municipal airport for an hour's flight over the central part of the city.

Grant Park, Chicago, was a blaze of light. An electric sign 500 ft. long and 70 ft. high was the center of the display. It showed an illuminated portrait of Edison centered in an outline of the first lamp and surrounded by a blaze of light. Forty loud speakers carried the Dearborn program to a large crowd of citizens.

A holiday was declared in Detroit by the City Council, where the jubilee and the President's visit aroused an interest that a drenching rain could not quench.

Along Euclid Avenue, Cleveland, from Public Square to East Twenty-second Street, 252 new ornamental lamps threw a brilliance rated at 504,000 cp. over the thoroughfare. The system contains 126 standards, 63 on each side of the street. Each pole is surmounted by two 2,000-cp. units. The new system is controlled from the municipal light plant station.

In the little village of Milan, Ohio, where the inventor was born, almost every window contained his likeness, and oldtimers swapped reminiscences of his earliest years. Port Huron, Mich., where he spent his boyhood, began preparations for a memorial stone in Pine Grove Park.

A 50,000-watt lamp, turned on at two-minute intervals for 60 seconds at a time, was installed on top of the Gas & Electric Building in Baltimore.

At Washington, the nation's capital, three huge searchlamps swept the sky, spotting airplanes from Bolling Field; a model electric house was opened, a hundred show windows made special displays, and there were motion pictures and lectures in the public schools.

In the Senate on Capitol Hill Senator Vandenberg of Michigan moved and Senators Edge and Kean of New Jersey seconded a resolution of felicitation to Mr. Edison.

Broad Street from Twelfth to Jefferson in Richmond and other streets were specially lighted for the celebration.

Battle Abbey, St. John's Episcopal Church, the Union Station and the Lee and Washington monuments were among the floodlighted structures.

In Buffalo, which began its observance last week, men and women in the costumes of 1879 promenaded the streets. Torchlight parades, a horse car, high-wheeled bicycles and horse-drawn carriages were conspicuous. Actors in "Uncle Tom's Cabin" were greeted by a hand-organ grinder and his dancing bear.

Conspicuous at Rochester was the floodlighting of the tower of the new library building of the university. This illumination will be permanent. The Rochester Gas & Electric Building was a solid wall of light. Cobb's Hill fountain was also illuminated.

At the Cincinnati Edison Exposition, held from October 20 to 26, the jubilee note predominated. Many spectacular exhibits were included.

Indianapolis specialized on the airplane feature, planes in night formation bearing Edison's name in electric light flying over the World War Memorial and specially lighted streets.

Brilliant illumination of the Minnesota State Capitol dome in St. Paul for the first time by a powerful new floodlight system on the night of October 21 climaxed the Twin Cities' celebration. Governor Theodore Christianson made the principal address.

Nearly every city in Oklahoma had special lighting features in honor of the anniversary.

Lafayette Square, in New Orleans, was brilliantly illuminated, as were many business buildings, and a public meeting in the square was addressed by prominent men.

Four thousand assembled at Memphis to witness the dedication of an electric fountain presented to the city by the Memphis Electric League with appropriate ceremonies, music and a costumed parade of school children. The fountain displays 24 layers of color.

Fifteenth, Sixteenth and Seventeenth Streets, the main thoroughfares of Denver, adopted golden lighting for a week.

Boise, Idaho, included in its program an old-fashioned bonfire with an exhibition by the city fire department.

On the Pacific Coast celebration was widespread. Before the Seattle Chamber of Commerce H. J. Gille of the Puget Sound Power & Light Company made the principal address, President A. W. Leonard of that company and Superintendent J. D. Ross of the municipal plant also speaking, while William Shoal recited the history of electric light to the Seattle Electric Club.

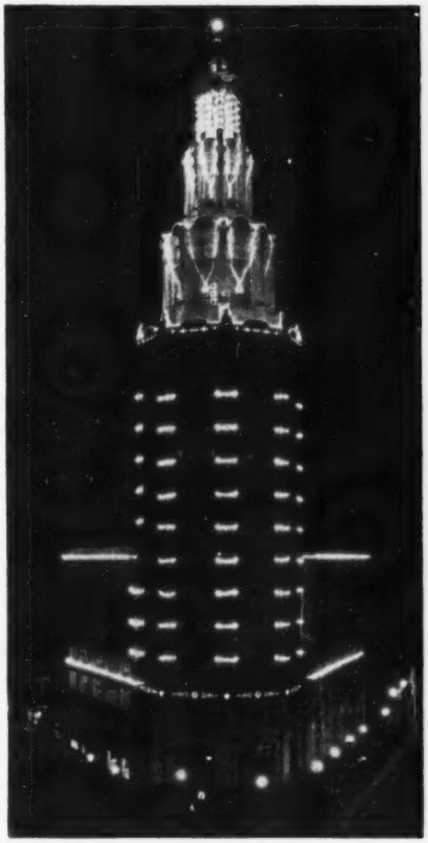
A widespread civic observance was carried out in Spokane, Wash., including an essay contest in the grade and high schools, special window displays by merchants and golden street lamps.

At Portland Franklin T. Griffith, president Portland Electric Power Company, spoke before the Chamber of Commerce. A lighting exhibition ran the gamut from candles through oil lamps and on to floodlighting. There was an electrical display on the waterfront.

Connors Creek Power Station, Detroit

San Francisco's Board of Supervisors put through a brief program, prominent buildings were illuminated, and the Electrical Development League staged lighting displays and a lamp tableau, with a speech by Ezra W. Decoto, member of the California Railroad Commission. At Los Angeles a spectacular display of colored light marked the occasion. Dr. Robert A. Millikan spoke before the Electric Club, President R. H. Ballard of the Southern California Edison Company presiding.

References to events or plans at many other cities, such as Boston, Hartford, Dayton, Youngstown, Pittsburgh, Louisville, St. Louis, Kansas City, Syracuse, Atlanta and Dallas, have appeared in "News of the Industry" in the last few weeks.



Buffalo General Electric Building

In Foreign Lands

Amsterdam was conspicuous among European cities paying tribute to Edison. The whole city was specially lighted, with a spectacular display on the Central Square. Public buildings were illuminated and the old canals in the town were bordered ten inches above the level of the water by lines of lamps which were reflected below. A special exhibition showed Edison's inventions in their primitive form and development, and American films adapted to the occasion were shown in the schools.

A unique honor was paid to Edison by Argentina, where his name has been given to streets or avenues in eighteen cities, including Buenos Aires and Rosario. In the former city an electrical exposition and a banquet marked the occasion.

Japan carried out a celebration on a nation-wide scale. Tokyo's main thoroughfares were lavishly illuminated and a jubilee banquet was held there under the auspices of the Japanese Electrical Society.

Chicago's Electric Association Hears Sloan

President of N.E.L.A., Introduced by Samuel Insull, Maps Rightful Course of Industry at Annual Meeting Permeated by Spirit of Jubilee Celebration

COMING as a climax to Chicago's celebration of "Light's Golden Jubilee," the banquet hall where the Electric Association of that city met for its fourth annual dinner on Tuesday evening, October 22, and the adjoining foyers were decorated in a manner to suggest the part that the electrical industries have played during the past half century in fostering the development of Chicago and the region of which it is the metropolis. During the banquet the history of light was depicted in tableaus.

George A. Hughes presided at the dinner, and Samuel Insull introduced the speaker of the evening, M. S. Sloan, president of the National Electric Light Association and of the group of merged companies serving Greater New York.

Mr. Sloan referred to the celebration of "Light's Golden Jubilee" at Dearborn, Mich., and elsewhere and to the growth of the electric light and power industry, technically, financially and commercially, since Mr. Edison's epoch-making invention. Rapid and momentous changes, he said, are now being made in the industry's financial and operating set-up. The business is being integrated into systems serving large sections of the country. This integration, according to Mr. Sloan, is one of the means by which economies are brought about, service improved, management and business methods bettered and more electricity furnished for lower prices.

But these changes and developments,

he said, are misunderstood and suspected so that the electric light and power industry and the laws under which regulation is administered are now being investigated by various official bodies. The condition of doubt and distrust which this situation engenders, the speaker went on, is a menace to the industry and also to the public and this menace should be abated.

It will be resolved satisfactorily in Mr. Sloan's estimation if the industry will do its job of completely electrifying America with an eye not only to business profits but also to public welfare. "I am convinced," he said, "that the business welfare of the industry and the public welfare require high concepts and progressive policies and practices which will win public approval because they merit it. Only on that basis will the industry be certain of an unhampered development along economic lines which will assure its future success and the doing of its job for its boss, the public, in fullest measure."

Kansas City Edison Pioneers Meet at Dinner

At Kansas City, where especially brilliant displays of lighting had their center in Petticoat Lane, rechristened for the time being "Golden Jubilee Lane," civic leaders gathered with electrical men in the banquet hall of the Hotel Muehlebach on the evening of October 19 for a commemorative dinner lighted by lamps of appropriate design. The dinner was rendered specially noteworthy by the presence of three Edison Pioneers—Joseph F. Porter, president of the Kansas City Power & Light Company, who presided; William M. Hand, Kansas City manager for the General Electric Company, and Edwin R. Weeks, "the man who brought electric light to Kansas City."

Some Facts About State Line Are Made Public

Unit No. 1 in the State Line Generating Company's power house at Hammond, Ind., just outside Chicago, has a rating of 208,000 kw., officially asserted to be more than double that of any other turbo-generator in the Middle West. This is one of a number of facts just officially made public concerning this large new station which supplies electrical energy at wholesale to the various Insull companies that serve the Chicago metropolitan district. Its connection with their stations has raised the total capacity of the system to 1,517,700 kw.

The present turbo-generator group unit, which is of General Electric manufacture, consists of one high-pressure steam turbine and two low-pressure turbines. The high-pressure turbine has a rating of 76,000 kw. and those on the two low-pressure machines are 62,000 kw. each. Each of the low-pressure turbines, in addition to its main generator, drives a 4,000-kw. direct-connected auxiliary generator, making the total of 208,000 kw. for the unit. The high-pressure turbine operates at 650 lb. steam pressure, higher than in any other generating station in the district. Pulverized coal is burned, and there are storage facilities for 125,000 tons.

Controverted Projects Up

Federal Power Commission About to Pass Upon Flathead Lake and Cumberland Falls—Changes in Passamaquoddy Bay Scheme

BECAUSE of the desire of members of the Senate interested in the Flathead Lake power project to have the principal arguments in one record, the Montana Power Company is expected to present testimony next week at the hearing requested by W. H. Wheeler, whose application was rejected. There has been some complaint from Senators friendly to Mr. Wheeler to the effect that the Federal Power Commission should itself have conducted a hearing before rejecting one of the conflicting applications. The commission, however, followed its established practice. If any new facts are developed at the coming staff hearing which justify a change of the decision, this can be done before the case goes to the commission proper. While Mr. Wheeler seems to have some backing in the Senate, the preponderance of opinion in the locality, judging from communications reaching Washington from municipalities, chambers of commerce, civic associations and commercial clubs, seems to favor the development of the project by the established power company.

Consideration of the Cumberland Falls project will be resumed promptly on the receipt of the opinion from the Attorney-General as to the authority of the commission to reject an application because of the effect of the project on scenery. The Attorney-General's opinion is not expected to be ready before November 1. After their visit to Cumberland Falls the three Secretaries making up the commission are in a better position, it is believed, to act in this much-controverted case.

In an effort to expedite the authorization of his Passamaquoddy Bay tidal-power project, Dexter Cooper has modified the application filed with the commission so as to bring the development entirely within the territorial waters of the United States.

Baltimore Concord Aids Pennsylvania Electrification

Conclusion of negotiations between the Pennsylvania Railroad and the city of Baltimore, under which $22,000,000 is to be spent in electrification and improvement of the Baltimore district of the railroad, opens the way for complete electrification of the road from New York to Washington, according to announcement on October 21.

The electrification of the Baltimore district was provided for in three ordinances passed by the City Council early last summer. They stipulate that the entire project must be completed within five years. The company first had proposed an overhead line across the city. The city's strenuous objections to this plan led to a compromise by which the line is to be carried overhead to the edge of the built-up portion of the city on the west and thence underground to a point on the right-of-way at the northeastern edge of the built-up part of the city.

Power Issue Injected Into the Tariff Debate

A motion to cut the duty on calcium carbide from 1 cent to one-half cent a pound was defeated in the United States Senate on Wednesday by 42 to 37. The discussion was enlivened by Senator Norris, who dragged into it his old bugaboo the "power trust," saying that the 1-cent rate was totally unwarranted and would not be demanded if hydro-electric power companies, which sell power for the manufacture of the chemical, would charge reasonable rates for their output. In Canada, the chief exporter of calcium carbide to the United States, the power rates were much lower, he argued.

Kansas Pioneer Says Company Honesty Grows with Size

Since Kansas' electric output averages 429 kw.-hr. per capita while that of the nation averages 692 kw.-hr. a person, Frank M. Stone, president of the Kansas Section, N.E.L.A., asked the delegates to the convention of that organization at Hutchinson on October 17 and 18 whether the electric utilities of Kansas are doing their part. "The problem may be solved," he said, "through increased attention to bringing in industries and electrification of rural districts."

Convention sessions, briefly noted last week, opened with a condemnation of municipal ownership by A. C. Malloy, a prominent attorney of Hutchinson. Roy Bailey, editor Salina *Evening Journal* and head of the industrial development committee of the Kansas Chamber of Commerce, complimented utility organizations on their support of the chamber and praised them for their ethical standards. Stanley Skinner, Southwestern Bell Telephone Company, Kansas City, Mo., illustrated his talk on developments in communication and transmission with a motion picture showing communication-line extension. G. W. Lapp, president Lapp Insulator Company, described the making of insulators. Progress in airport illumination was the subject of E. R. Cullum, Westinghouse Electric & Manufacturing Company. Round-table sessions, a playlet and a women's committee dinner were other events.

The principal address of the convention was made by Tom McNeal, editor

Kansas Farmer, Topeka. Mr. McNeal, a pioneer, described vividly the contrast between conditions existing fifty years ago and those of today. He complimented the industry on its advance and particularly on its "increasing honesty." "Today the whole economic structure of the nation hinges more upon honesty than it ever did before," Mr. McNeal said. "We need have no fear of large businesses, for I am convinced that increasing size only makes for greater honesty and higher ethics."

The convention closed Friday night with a dinner-dance and carnival. Approximately three hundred delegates were registered. Dean E. Ackers, assistant general manager Kansas Power & Light Company, Topeka, was elected president.

New York Commission Chairman's Recommendations

Further recommendations for changes in the New York Public Service Commission law were made by Chairman William A. Prendergast at the resumed hearings before the investigating legislative commission on Thursday and Friday of last week. Among the formal suggestions were: Clarification of the law regarding the acquisition or holding of more than 10 per cent of a utility capital stock without commission permission so that it might apply to 10 per cent of the voting stock; extension of present stock dividend restrictions to all utilities; elimination of ownership subterfuges as regards, trustees, nominees, brokers and banks; extension of control to issuance of securities of foreign corporations; prohibition of crediting advertising and promotional costs to insure increased appliance sales as operating expenses when utility and manufacturing interests are closely related; advisability of permitting the commission to sit with those of other states on interstate problems, and a full filing of the names of actual owners of voting stock by utilities at the time of submitting annual reports to the commission.

Commissioner Prendergast also expressed the opinion that, on the whole, the present law affords adequate protection to consumers and security holders. Several of the members of a public service commission should be lawyers, he held, as such man have the viewpoint that is most helpful. The proposed pro rata assessing of utilities to meet commission expenses he thought "indefensible."

Prof. J. C. Bonbright, a member of the investigating commission, at the Thursday hearing termed the rate-making practices of the commission "a vicious system," following the admission by Commissioner Prendergast that "there has been an absence of the exact data which it would be well for the commission to have in respect to the elements of cost" and that the co-operation of the commission and the utilities has been relied upon to establish bases for reasonable rates.

A docket of formal expressions of dissatisfaction by corporation counsels representing municipalities through the state was placed in evidence. Embodied was a protest that the consuming public was not really represented at commission hearings unless outside experts were hired.

Purchases and Mergers

United Gas Improvement Purchases Commonwealth Utilities Corporation —Pennsylvania Power Company Merger Still Strongly Opposed

THE Commonwealth Utilities Corporation, with headquarters at St. Louis, has been purchased by the United Gas Improvement Company. It is asserted that stockholders of the Commonwealth company will receive one share of United Gas Improvement stock and $11 in cash for each share of stock held. There are 155,679 shares of Commonwealth stock outstanding and in addition $2,500,000 in bonds. Rumor recently had the American Power & Light negotiating for the Commonwealth. The latter's electrical subsidiaries include the Arizona Power Company, the Prescott (Ariz.) Gas & Electric Company and the Columbus, Delaware & Marion Electric Company of Ohio.

Testimony that the Harmony (Pa.) Electric Company sold its transmission system for $1,660,000, although officers of the company had testified at a Public Service Commission hearing that the "pole line" was worth only $50,000, was given at a recent hearing before Public Service Commissioner Samuel Walker on the proposed merger of the Pennsylvania Power Company, the Harmony Electric Company and the People's Power Company into the Pennsylvania Power Company. The Harmony Electric Company, it was asserted, pays $100,000 a year carrying charges on this property. The merger continues to be strongly opposed.

The Middle West Utilities Company has announced the consummation of the plans to include the properties of the United Public Service Company in its utilities system, as announced last summer (ELECTRICAL WORLD, August 17, page 348).

The Illinois Northern Utilities Company has been authorized by the Illinois Commerce Commission to purchase the Rock River Light & Power Company for $450,000 cash.

The Tennessee Electric Power Company has bought the Celina electric plant, the sale to take effect as soon as it obtains the franchise in Clay County.

The Missouri-Tennessee Power Company has made application to the Missouri Public Service Commission for permission to acquire more than 10 per cent of the capital of the Missouri Southern Public Service Company of Cassville. It proposes to buy all of the outstanding stock. This is now held by the Union Electric & Gas Company of Delaware, which is disposing of all its stock holdings.

After negotiations lasting for nearly two years citizens of Cartersville, Ga., have voted by 593 to 483 not to sell their municipally owned power plant to the Georgia Power Company.

The Georgia Power Company has purchased the properties of the Northern Georgia Light & Power Company, consisting of two small water-power plants near Dahlonega and lines.

Municipal purchase and operation of the Dallas Power & Light Company is advocated by Mayor Waddy Tate of that city.

Negotiations between the Northwestern Electric Company, Portland, Ore., and the city of Yacolt, Wash., looking toward the entry of the company into Yacolt to replace the municipal system have been completed by granting the company a 50-year franchise.

The Puget Sound Power & Light Company, Seattle, has purchased the holdings of the Darrington Light & Power Company of Everett, Wash., including its electrical distribution system.

The Public Service Company of Colorado has purchased the electric plant at La Jara, which served that town and surrounding country, and will build a transmission line thither from Alamosa.

Subject to the approval of the ratepayers, the City Council of Kamloops, British Columbia, has decided to accept the offer by the British Columbia Electric Railway Company of $600,000 for the city power plants and franchise.

The Canada Power & Paper Corporation of Montreal has completed arrangements to acquire the Wayagamack Pulp & Paper Company and the Port Pulp & Paper Corporation, both of which are said to own valuable water-power sites.

Further expansion of the Avon River Power Company in the Province of Nova Scotia is indicated in its purchase of the Edison Electric Light & Power Company of Springhill, N. S. Another addition to the Avon River system was made through the recent purchase of the electric light plant at Oxford, which will be linked up with the Springhill unit in the near future.

The American & Foreign Power Company, an auxiliary of the Electric Bond & Share Company, has acquired the municipal electric plant at Bello Horizonte, Brazil, and a 50 per cent interest in Tata Sons, Ltd., of India, controlling hydro-electric plants near Bombay.

Spectacular Developments of Bell Telephone Research

An impressive and most entertaining demonstration of commercial developments that have recently been made possible by research in the Bell Telephone Laboratories was staged by S. P. Grace, assistant vice-president of the laboratories, in an address before the New York Electrical Association on October 23. Among the spectacular demonstrations he conducted were the storing of speech for four and one-half seconds, projecting sound sensation into the brain electrostatically without the medium of sound waves, transmitting speech in unintelligible form and then decoding it, talking without using the vocal cords, two-way radio communication with an airplane, use of original Bell transmitter for operating a loud speaker, recording heart noises, and the effect of deleting frequencies from music.

Mr. Grace said that these and other research developments, which represent the work of four thousand Bell Telephone Laboratory men, save money or make possible a service previously unobtainable. They are, he said, merely examples of what any industry can do if an organization for exploration is formed which is not burdened with details of operation.

Fifty-Fifty Shares in Boulder Dam Power

This Is Secretary Wilbur's Provision in Proposed Plan Covering Division Between Public and Private Agencies—Southern California Edison Thought Acquiescent

PUBLIC agencies and the utilities are equal beneficiaries under the plan for allocation of Boulder Dam power announced on October 21 by Secretary of the Interior Wilbur, following a series of conferences with the applicants that extended throughout the preceding week. As outlined by Secretary Wilbur, the power to be developed at the dam, subject to certain deductions, is to be distributed as follows: To the Metropolitan Water District of Southern California, 50 per cent, or so much thereof as may be needed and used for the pumping of Colorado River water; to the city of Los Angeles, 25 per cent, and to the Southern California Edison and associated companies, 25 per cent.

Following are other provisions of the proposed agreement sponsored by Secretary Wilbur:

The allotments are to be subject to certain deductions which may arise through the exercise of preference rights, i.e., (a) not exceeding 18 per cent of the total power developed for the State of Nevada for use in Nevada; (b) not exceeding 18 per cent of the total power for the State of Arizona, for use in Arizona, as above; and should either of the states not exercise its preference rights the other may absorb them up to 4 per cent; (c) not exceeding 4 per cent for municipalities which have heretofore filed applications.

All such preference rights in whole or in part are to be exercised by the execution of valid contracts with the respective states and municipalities satisfactory to the Secretary, and the exercise of such preference rights is to reduce proportionately the above allotments to the district, the city and the company.

Any state desiring to withdraw power within the limitations above stated must serve on the Secretary of the Interior written notice within not less than twelve months of the amount of power desired and for the purchase of which valid contracts satisfactory to the Secretary must be executed.

Power contracted for but not required within a state shall be allocated to the city and the company on a 50-50 basis, with the reservation that it can again be called for within a reasonable time for use within the state. All power provided a state shall be at actual cost.

Should the 50 per cent allocated to the Metropolitan Water District be not required for pumping, this shall become available to the city of Los Angeles to the amount of 66⅔ per cent and to the Southern California Edison and associated companies to the amount of 33⅓ per cent.

Any municipalities desiring the power within the limitation prescribed must execute the necessary contract therefor within twelve months from the date the contracts are made with the district, the city and the company.

Any firm power available at the Boulder Canyon Dam for the payment of which other contractors do not become and remain liable, aside from that allocated to the Metropolitan District, shall be taken and paid for by the city of Los Angeles and the Edison company on a 50-50 basis.

The contract for the available power is to be made with the city of Los Angeles and the Metropolitan Water District, with various sub-contracts assuring the above, and provide for a board of control made up of two members nominated by the city of Los Angeles and the Metropolitan Water District, two by the Southern California Edison and associated companies, and one by the Secretary of the Interior, to act with the city of Los Angeles in the operation of the plant.

The federal government will install the dam, tunnels, power house and penstocks. The machinery for the generation and distribution of power is to be provided and installed by the lessees. The costs of installation and operation are to be borne by those contracting for the power in proportion to the amounts received. When the dam and power house are actually in operation the lessees may have the right to ask for a review of the actual cost of units of power and be entitled to deductions which will still permit the charge made to return to the government all advances and interest in accordance with the Boulder Dam act; provided further that if such review indicates that a higher rate should be paid for power to meet the obligation to the federal government such an advance in rate will be put into effect.

There will be a clause inserted in all of the contracts which will insure the distribution of all power developed at the Boulder Dam at such a price as in the opinion of the Federal Power Commission is fair to all consumers. Should certain municipalities operating their own power plants desire to make separate agreements with the city of Los Angeles and the Metropolitan Water District, they shall be supplied with power at cost price.

The charge for storing water for the Metropolitan Water District will be 25 cents per acre foot.

The representatives of the Southern California Edison Company regard the plan of Secretary Wilbur as tentative and will be prepared to present further arguments regarding several features of the matter at the hearing which has been set for November 12. The Secretary's decision that the power shall be divided in general on a fifty-fifty basis will, spokesmen for the power company say, be satisfactory to them, although they contended at the outset of the conferences that in the allocation of power from the dam a ratio of 81 per cent to the utilities and 19 per cent to the public agencies would be equitable, as that is the ratio which exists at present in the distribution of power.

Secretary Wilbur's plan incorporates the proposal of the Southern California Edison Company that operation of the power plant shall be in the hands of a board of control on which the power company and the Metropolitan Water District of Los Angeles shall have equal representation. It is expected that the company will object to the provision of the Secretary's plan providing for one contract with the Water District, supplemented by sub-contracts between the Water District and other applicants. The belief is expressed by representatives of the power company that it should be permitted to contract direct with the government for the amount of power to which it is entitled.

In addition to the Metropolitan Water District, the city of Los Angeles and the Southern California Edison Company, twenty other applications were received for purchase of power. The list below shows the name and address of the applicant and the amount of power desired:

Nevada-Colorado River Development Commission, Carson City, Nev.:
Three applications, one for 180,000 hp., one for 25 per cent of total amount developed and one for one-third of total amount developed. Assumed load factor, 76.5. Kilowatt-hours per year, 1,200,000,000.*

Metropolitan Water District, Los Angeles:
All or equitable allocation (280,000 hp.). Assumed load factor, 92. Kilowatt-hours per year, 1,683,000,000.

City of Los Angeles:
520,000 hp. Assumed load factor, 55. Kilowatt-hours per year, 1,869,000,000.

Southern California Edison Company, Los Angeles:
One application for all or equitable allocation and another for 62.3 per cent of total power available at Boulder Dam, or single purchasing agent for all power for southern California. Kilowatt-hours per year, 2,243,000,000.*

Southern Sierras Power Company, Denver:
One application for 45,000 kw. and another for 7.94 per cent of all power generated. Kilowatt-hours per year, 280,000,000.*

Los Angeles Gas & Electric Corporation, Los Angeles:
One application for 45,000 kw. and another for 73,000 hp., or one-third of the amount allotted to California. Assumed load factor, 55. Kilowatt-hours per year, 262,400,000.†

San Diego Consolidated Gas & Electric Company, San Diego:
3.9 per cent of total allocated to southern California. Kilowatt-hours per year, 105,300,000.‡

Palo Verde, Mesa and Chuckwalla Valley Development Association, Los Angeles:
18,000 kw.

City of Santa Ana, Calif.:
10,000 hp. Assumed load factor, 45. Kilowatt-hours per year, 29,407,000.

J. T. Dobbins, Fredonia, Ariz.:
Amount not stated.

Katherine Midway Mining Company, Los Angeles:
5,000 firm hp.

City of Glendale, Calif.:
50,000,000 kw.-hr. Assumed load factor, 45.

United Verde Copper Company, Clarkdale, Ariz.:
20,000 kw. to 100,000 kw. Assumed load factor, 92. Kilowatt-hours per year, 161,184,000.

City of Pasadena, Calif.:
24,500 firm hp. Assumed load factor, 45. Kilowatt-hours per year, 72,051,000.

City of Burbank, Calif.:
20,000,000 kw.-hr. per year. Assumed load factor, 45.

Consolidated Feldspar Corporation, Trenton, N. J.:
120 hp. to 325 hp.

Yuma Utilities Company, Denver, Colo.:
20,000 kw. Assumed load factor, 55. Kilowatt-hours per year, 96,360,000.

Public Utilities Consolidated Corporation, Kingman, Ariz.:
100,000 kw. Assumed load factor, 45. Kilowatt-hours per year, 394,200,000.

Mohave County, Ariz.:
100,000 hp.

City of Newport Beach, Calif.:
10,000 hp. Assumed load factor, 45. Kilowatt-hours per year, 29,407,000.

Arizona Power Company, St. Louis, Mo.:
30,000 hp. Assumed load factor, 75. Kilowatt-hours per year, 147,037,000.

State of Utah, Colorado River Commission:
50,000 hp. Assumed load factor, 75. Kilowatt-hours per year, 24,060,000.

City of San Diego, Calif.:
28,000 hp. Assumed load factor, 100. Kilowatt-hours per year, 200,000,000.*

*Based on 3,600,000,000 kw.-hr. †73,000 hp. used. ‡Based on 2,700,000,000 kw.-hr.

Prairie Province News

Calgary Company Will Sell Hydro Power to Edmonton and Buy Steam Power from That City—Saskatchewan's Public System

NEGOTIATION of a five-year contract by which the Calgary (Alberta) Power Company will supply hydro-electric power to the city of Edmonton, about 150 miles north, and will also purchase power from the Edmonton municipal plant at times of low water is announced. The contract will involve construction of a 132-kv. line, the first of so high a voltage in the province, from the Calgary company's Bow River plant to Edmonton and intermediate towns. Edmonton will pay 0.5 cent per kilowatt-hour for the first 20,000,000 kw.hr. and 0.4 cent for all in excess. The Calgary company will pay Edmonton the average cost per kilowatt-hour plus 10 per cent.

Approximately 7,000 hp. of electrical energy will be available at Bow River about the first of November. This will be from a low head. When the full capacity is obtained the plant will produce about 36,000 hp. Its cost is to be $2,500,000. The transmission line will be pushed to completion and will probably be in service early next year.

The Calgary company says that it has 240,000 hp. available in the Bow River watershed, including Spray Lakes. Of this it is planned to develop 65,000 hp., after the Ghost River plant is finished. The company has 32,000 hp. now installed on Bow River, but occasionally less than 5,000 hp. has been available from this source, and it is estimated that at minimum low water only 7,000 hp. can be had from its new 30,000-hp. Ghost River plant.

The city of Edmonton will order a new steam unit of 1,500 kw. at a cost of $1,800,000. It has now one 10,000-kw. modern unit and some old equipment of poor efficiency. Many citizens have demanded a vote on the agreement before it goes into effect, and they may prevail.

In the adjoining province of Saskatchewan the power plant being erected at Saskatoon by the provincial government, at an estimated cost of $1,850,000, is rapidly nearing completion and is expected to be ready for operation by November 15, the contract date. This plant is intended as the nucleus of a publicly owned provincial system.

A new government is now in control of Saskatchewan. It intends to adhere to the principle of public ownership, according to Premier J. T. M. Anderson. "In the matter of power it is the intention of the government to recognize and foster this principle," he said. "The Power Commission, which now controls plants at Saskatoon and a number of other centers, will have its power enlarged and amplified with the fullest indorsation and support of the government. It is the intention of the government to discourage further extension by private companies of high-power transmission lines. All such lines will in future be built by the Power Commission. Negotiations will at once be entered upon with a view to bringing all their holdings under a comprehensive provisional scheme of public ownership."

Licenses Authorized for Lewis and Columbia Rivers

A license for the Inland Power & Light Company of Portland, Ore., was authorized by the Federal Power Commission at its meeting October 16, following compliance with a preliminary permit covering the development of power on the Lewis River. The proposed license is to cover the Ariel site, where it is planned to install 54,000 hp., with an ultimate installation of 216,000 hp. Pre-license costs have not been agreed upon, but the commission waived previous provisions on this point so that construction work may begin this fall.

A license was authorized for the Washington Electric Company of Seattle covering a project on the Columbia River near Wenatchee. The initial installation is to be 84,000 hp. with a subsequent addition of 210,000 hp. The license is to contain a condition that the commission's findings with regard to pre-license costs are to be accepted. The Chief of Engineers in reporting on this project said that it would fit into any comprehensive scheme for the improvement of the Columbia River for navigation and would not interfere with proposed plans for irrigation.

An amendment to the license of the San Joaquin Light & Power Corporation was authorized postponing the period of construction of certain works. A license for Hyrum City, Utah, was also authorized. It covers a small installation on Blacksmith Fork, Utah. A preliminary permit was authorized for the Gasconade River Power Company of Kansas City covering a 12,000-hp. project in Pulaski and Phelps Counties, Mo., as was a permit for J. N. MacDonald of Sarasota, Fla., covering a 16,000-hp. project on the Oklawaha River.

N.E.L.A. Electrification Subcommittee Reports

Its European Survey Shows Progress Since the War on the Continent and British Isles and Draws Five Conclusions—Relation to Power Development

APPENDED to a serial report just issued by the National Electric Light Association's committee on steam railroad electrification is a report from the subcommittee which went abroad late last year to make a survey of practice and progress in such electrification in European countries. This subcommittee was composed of Harley A. Johnson (chairman), L. E. Fischer, Horace H. Field and Reinier Beeuwkes.

The subcommittee visited England, the Netherlands, Sweden, Germany, Switzerland, Italy and France. In addition to examining most of the steam railroad electrifications in these countries, the rapid transit subways were inspected in London, Berlin and Paris. After describing foreign electrification work in detail the subcommittee presents the five general conclusions here condensed:

"(1) Electrification has so far been undertaken in definite localities for certain special reasons.

"(2) Electrification will be extended where it now exists and introduced into new districts for the same compelling reasons.

"(3) Most of the electrification in Europe has come into existence since the war.

"(4) The establishment of large commercial power systems (both private and state-owned) in Europe has also been a post-war development, followed by interconnection of power systems so as to provide large pools of power.

"(5) Recognition of the technical advantages of securing power from the large commercial networks seems quite generally and constantly increasing in effect."

Appended to the general report is the report of a subcommittee on "standard form of contract." This committee has been making a study of the contracts used in this country for the sale of energy to electrified railroads and has outlined the desirable features to include in such a contract.

In the general report are included two comprehensive tables, one giving a condensed analysis of electrically operated installations on steam railroad lines, the other the physical characteristics of operation. An appendix contains statements on electrification from Presidents W. W. Atterbury of the Pennsylvania Railroad, A. T. Dice of the Reading and P. E. Crowley of the New York Central.

Louisiana Utilities Benefit by Industrial Co-operation

Louisiana Steam Products, Inc., a newly formed subsidiary of the Engineers' Public Service Company, a holding-company ally of Stone & Web-

ster, will build at once at Baton Rouge a boiler plant capable of supplying an estimated refining-plant demand of more than 6,000,000,000 lb. of steam per annum, as well as an electric generating plant of 45,000 kw. rating, to cost approximately $6,000,000. Steam will be generated at 650 lb. pressure and put through turbines having an exhaust pressure of 135 lb., at which pressure it will be sold to the Standard Oil Company of Louisiana for use in its refining plant.

The by-product electricity generated in this process will approximate 260,000,000 kw.-hr. per annum, of which about half will be sold to the refining plant for power purposes. The remainder will be sold to subsidiaries of the Engineers' Public Service Company which furnish electric service in this territory, including the Baton Rouge Electric Company and the Gulf States Utilities Company. The gross business covered by the contract with the Standard Oil Company is estimated to be $1,600,000 annually. The boiler plant will burn as fuel the sludges and waste fuel from the refining processes of the Standard Oil plant and will use natural gas for the rest of its requirements. Construction will be started immediately on the new plant, and it is expected to be in operation in about seven months.

Water-Power Tax Opposed by Attorney-General Ward

Speaking before the annual convention of the State Waterways Association at Albany, N. Y., last week, Attorney-General Hamilton Ward of New York said that he was not in accord with the Conservation Department of that state in its policy of taxing water power. On this point Mr. Ward said:

The state has made a start in regulating the use of power and the rate to be charged therefor when produced in state-owned waters. The conservation law does not purport to cover power produced in privately owned waters. Most of the power in the state is produced by sources not under control of the Conservation Commission, and in exercising the rate- and rent-fixing powers conferred upon the Conservation Commission and the Public Service Commission the cost of power otherwise produced has to be considered. The state has never developed any theory covering the rental value of its power, and rates range from 65 cents to $29 a horsepower, depending to some extent it is true on the state investment in the licensed premises.

In a recent rent fixing by the Conservation Commission I sought to have the state adopt a general theory of rent fixing. The position of the majority of the commission was that where cheap power was produced a substantial rental should be charged in order that the benefits of the situation might be as widely distributed as possible. It was my position that the opportunity to develop cheap power was a local or geographical advantage just as the location of a mine, oil field or great harbor was.

We do not tax the oil and gas wells of the Southwest as a special advantage, and in my judgment a community situated at a water power should have the natural advantage that arises from the ordinary operation of economic laws.

Southern Electrical Inspectors Meet at Atlanta

The first meeting of the Southern Section of the International Association of Electrical Inspectors was held in Atlanta on October 15 to 17, inclusive, with a registration of 187. President N. E. Cannady of Raleigh, N. C., presided. Organization was perfected and reports were read from various subcommittees dealing with the different parts of the National Electrical Code. It was the sense of the meeting that inasmuch as the code provisions must be subject to change from time to time these changes should in so far as practicable come about as the result of the more intimate contact that the electrical inspector has in the field.

The problems of the inspector were discussed from the standpoint of his relation to the code and its application through supervision and advice to obtain the maximum protection consistent with minimum cost for inspection. A movement was launched to protect the public against imperfect electric cord by means of special labels.

Favorable comment was aroused by the paper of H. L. Wills, Georgia Power Company, on "The National Electrical Code from the Public Utility Viewpoint." Mr. Wills recommended a revision in the form of the code, saying: "Nowhere will be found a statement of principle; nowhere will be found a clear, concise statement of fundamental practices. All through this code the dominant note lies along the line of construction specifications and, because principle, practice and construction specifications are so interwoven, the code as a whole takes on the aspect of an arbitrary, ruthless group of rules that are not only denied respect but engender open antagonism and evasion." Mr. Wills said further that in his estimation the code as it now stands is a group of separate, disconnected rules, established under no guiding principle or group of principles, and is therefore subject to misinterpretation throughout the country. His suggestion was for the revision of the code into three major sections, the first devoted entirely to statement of principle, the second concerned with practices in detail, and the third devoted to construction specifications. It was Mr. Wills' opinion that the code requirements as they stand provide all of the necessary values for the establishment of such a revision without extended discussions.

The following officers were elected for the coming year: President, L. T. Rogers, Shreveport, La.; first vice-president, H. N. Pye, chief electrician Southeastern Underwriters' Association, Atlanta; second vice-president C. S. Graham, Jacksonville, Fla.; secretary and treasurer, R. L. Gatewood, Atlanta. Jacksonville was selected as the place of the next meeting.

Briefer News

NEW DAM BEING BUILT AT THERESA (N. Y.) HYDRO PLANT.—The St. Lawrence County Utilities is pushing work on a new dam at Theresa, N. Y., and new equipment is being installed in the power house. The new dam will raise the level of the Indian River about 19 ft., wiping out an island between the two old dams.

IMPROVING INDUSTRIAL SERVICE FOR JEANNETTE, PA.—A new substation costing $150,000 has been put into service at Jeannette, Pa., by the West Penn Power Company. Previously energy was supplied by two lines from Manor. The new service brings two 25,000-volt lines into Jeannette, one from Manor and the other from Luxor, guaranteeing continuous service to this industrial center.

BOSTON EDISON TO BUILD TRANSMISSION LINE FROM WOBURN TO TEWKSBURY, MASS.—The Edison Electric Illuminating Company of Boston has petitioned the Massachusetts Department of Public Utilities for authority to construct a transmission line from the Woburn station of the company to the Burlington-Billerica town line. At that point it will connect with the New England Power Company's line and its substation at Tewksbury.

ILLUMINATING WATERFALLS ALONG SCENIC HIGHWAYS ON THE PACIFIC COAST.—Civic organizations in Oregon have been requested by the Portland Chamber of Commerce to aid a plan whereby the many waterfalls bordering the state's scenic highways may be electrically illuminated. Citizens of Multnomah County have initiated a movement to provide lighting effects for the series of waterfalls along the Columbia Highway, and other community bodies are reported to be interested.

RATE REVISION IS TO CONTINUE IN GEORGIA.—An order requiring the Georgia Power & Light Company of Valdosta to show cause why its rates on residential light and power should not be revised and made uniform has just been issued by the Georgia Public Service Commission. The order, which is returnable on November 26, is similar to those issued within the past few months against the Georgia Power Company, the Columbus Electric & Power Company and the South Georgia Power Company.

EXTENSION OF RURAL SERVICE SOUGHT BY OREGON COMMISSION.—According to Public Service Commissioner Frank J. Miller of Oregon, the regulatory body of that state will soon begin an intensive study of the rules, regulations and practices now governing the extension of light and power

service with the purpose in view of enabling farmers to obtain service with less inconvenience and expense to both themselves and the utility operators. The commission will seek the co-operation of the utilities to perfect new rules and methods by which rural electric service may be advanced at a rate more in keeping with the developments of the industry in the cities and towns.

LOCAL COMPANY WINS FRANKLIN (TENN.) CONTEST.—Approval has been given by the Tennessee Railroad and Public Utilities Commission to the franchise granted by Franklin, Tenn., to the Franklin Power & Light Company, conditions of which the commission disapproved having been eliminated. As previously reported, the local company's application was opposed by the Southern Cities Power Company and the city was left for a short time without legally authorized service.

SPECIAL COMMISSION PICKS THREE SITES FOR NEBRASKA DAMS.—Preliminary surveys by the engineers appointed by the state commission created at the last session of the Nebraska Legislature to discover where it may be possible to locate dams for the double purpose of storing floodwaters and manufacturing electrical energy have been completed. Clark E. Mickey, head of the State University civil engineering department, who is in charge, says that the plans call for the diversion of floodwaters of the North Platte at Keystone and the erection of three dams in the Box Elder, Cottonwood and Snell canyons.

WORK ON NEW HOLTWOOD PLANT TO START NEXT SPRING.—Plans are being made to start construction work on the hydro plant to be built at Holtwood by the Safe Harbor Water Power Corporation (ELECTRICAL WORLD for October 19, page 797) next spring, and it is thought probable that the Arundel Corporation of Baltimore, which built the Conowingo Dam and is now building the dam on the Saluda River in South Carolina, will obtain the contract. As before stated, the new development will be on the Susquehanna River 8 miles upstream from the Holtwood plant of the Pennsylvania Water & Power Company.

SOUTHERN TENNESSEE POWER'S MUSCLE SHOALS PLANS.—Answering questions propounded by the Alabama Public Service Commission in regard to the plans of the Southern Tennessee Power Company of Chattanooga to build a transmission line from Muscle Shoals into Tennessee within the next six months in order to use in that state secondary power from the federal government's plant, especially in the Nashville district (ELECTRICAL WORLD for October 5, page 700), J. C. Guild, Jr., president of the Southern Tennessee Power Company, which is a subsidiary of the Tennessee Electric Power Company, has replied that it is not yet known whether the power will be purchased from the government or from some intermediary company. The Southern Tennessee company, he says, does not expect to distribute or sell power in Alabama and the company has no contract with any one other than a federal permit to construct a line over the government reservation and across the Tennessee River.

BALTIMORE COMPANY COMPLETES SIX OUTDOOR STATIONS, CLOSING TRANSMISSION RING.—Four months' work during which six large outdoor substations and approximately 27 miles of 66-kv. transmission line were constructed is being brought to a close by the Consolidated Gas, Electric Light & Power Company of Baltimore, completing a ring around the city. The new substations are known as Naval Academy Junction, Annapolis, Frederick Road, Westport, Pumphrey and Gwynnbrook. The Naval Academy station contains air-break switches for sectionalizing the high-voltage line and for the high-voltage side of the 2,000-kva. transformer bank; the Annapolis station, not yet completed, is designed to carry the entire 60-cycle load of that city; the Frederick Road station will have four 2,500-kva. transformers and a 13,000-volt bus and switching structure; the Westport (ring end) station, with four 12,500-kva. transformers, is designed for future operation at 110 kv.; the Pumphrey sectionalizing station at present contains only air-break switching equipment, while the Gynnbrook station, accommodating the existing ring circuit, is complete except for the installation of a 132-kv. oil circuit breaker.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see issue of July 6, page 46.]

North Central Division, N.E.L.A.—Accounting Section, Nicollet Hotel, Minneapolis, Oct. 28 and 29; Commercial Section, St. Paul Hotel, St. Paul, Jan. 20-21. J. W. Lapham, 803 Plymouth Bldg., Minneapolis.

National Electrical Credit Association—Middle and Southern Atlantic States Association, Hotel Sylvania, Philadelphia, Nov. 8; Central Division, Nov. 21 and 22 (place to be selected); New York Division, Hotel Pennsylvania, New York City, Dec. 10; New England Division, University Club, Boston, Jan. 21. F. P. Vose, 1008 Marquette Bldg., Chicago.

National Electrical Wholesalers' Association—Hotel Cleveland, Cleveland, Nov. 11-15. E. Donald Tolles, 165 Broadway, New York.

Public Utilities Association of Virginia—Chamberlin-Vanderbilt Hotel, Old Point, Va., Nov. 21 and 22. A. B. Tunis, 306 Grace Securities Bldg., Richmond, Va.

American Institute of Electrical Engineers—District meeting, Chicago, Dec. 2-4; winter meeting, New York, January 27-31. F. L. Hutchinson, 33 West 39th St., New York.

American Institute of Mechanical Engineers—New York, Dec. 2-6. C. W. Rice, 29 West 39th St., New York.

American Society of Refrigerating Engineers, New York, Dec. 4-7. D. L. Fiske, 37 West 39th St., New York.

MEXICAN LIGHT & POWER COMPANY'S NEW DAM.—A new dam across the Lerma River, near Tepuxtepec, State of Michoacan, Mexico, will serve a hydro-electric plant of 60,000-hp. capacity, besides irrigating 100,000 acres of valley lands and preventing floods. The plant, which will be completed soon, is being constructed by the Mexican Light & Power Company, Ltd., a Canadian concern, owning hydro-electric plants at Necaxa, about 100 miles from Mexico City, and serving the capital and other cities. The company will construct transmission lines from its new plant near Tepuxtepec to towns and industrial centers within a radius of 150 miles. The dam and power plant will cost approximately $12,500,000.

ST. LOUIS TO HAVE EIGHT MILES OF 66-KV. UNDERGROUND CONDUIT ACROSS CITY.—In connection with the building of the hydro-electric dam and power plant on the Osage River near Bagnell, Mo., several high-voltage transmission lines are being constructed which, together with existing lines, will form a complete loop connecting the three steam generating plants and the two water-power plants operated by the Union Electric Light & Power Company of St. Louis and its subsidiaries. A 66-kv. two-circuit underground transmission line constructed across the city of St. Louis will form part of this ring. This line, about 8 miles in length, will extend from the Venice power plant, east of the Mississippi River, to the Page Avenue substation, about one-half mile west of the city limits. It will be connected through switching, transforming and protective equipment with the 66-kv. overhead tower line leading from Venice to Cahokia and with the 132-kv. tower line now being constructed between Bagnell and the Page Avenue substation.

INDIANA PUBLIC SERVICE COMMISSIONER CONDEMNS "CUSTOMARY EXAMINATIONS."—"Customary" methods of conducting public utility examinations, used by the engineering department of the Indiana Public Service Commission, drew the fire of Calvin McIntosh, a member of the commission, in a hearing recently on petitions requesting bond and stock issues to cover costs of capital expenditures. When Harry V. Wenger, chief engineer for the commission, indorsed expenditures reported by the Indiana General Service Company of Muncie, Mr. McIntosh questioned him minutely as to whether he had inspected all the property which officials of the company said had been added to their capital outlay, and, on being told by the engineer that he had examined both books and property in three days, making "the customary examination made by our department," the commissioner expressed dissatisfaction, declaring that the customary examinations had "long been unsatisfactory to the public and the consumer." Mr. McIntosh declared also that he, as one member of the commission, was opposed to heavy bond discounts.

BUENOS AIRES' NEW GENERATING PLANT.—Official dedication of the new Buenos Aires power plant of the Compañia Hispano-Americana de Electricidad (commonly abbreviated to "Chade") took place during the past summer. This plant, begun three years ago, is built on land reclaimed from the river. It now contains two 52,500-kw. General Electric turbo-generators served by eight Babcock & Wilcox boilers burning pulverized coal. Provision for expansion will allow twelve turbo-generators under a single roof in a room 800 ft. long. The turbines are tandem-compound taking steam at 550 lb. gage pressure and 750 deg. F. The company is one of a large group of utilities owned by the French holding concern Société Financière de Transports et d'Enterprises Industrielles. Sargent & Lundy, Chicago, were consulting engineers for the project.

DALLAS POWER & LIGHT FINISHES ITS UNDERGROUND-TRANSMISSION PROGRAM.—The Dallas Power & Light Company has completed its three-year program of placing underground its alternating-current electric network system in the business district of the Texas city. The cost of this work was upward of $2,500,000, and the system as it now stands has an ultimate capacity of 24,300 kw., which is about double the present peak-load demand. The company is enlarging its power station at a cost of approximately $3,000,000. With the addition it will be able to generate 82,500 kw., an increase of 25,000 kw. The extension, begun last January, is scheduled to be completed by January, 1930. Space in the boiler room will be saved by building the new concrete stack, now necessitated, from the roof of the station, massive steel work being carried in the skeleton of the building to support it.

BRITISH COLUMBIA RAILWAY COMPANY'S PLANS FOR TRANSMISSION FROM RUSKIN.—Plans for the first and second 60-kv. transmission circuits from the Ruskin hydro-electro power plant, now in course of construction, to Vancouver have been announced recently by the British Columbia Electric Railway Company. These lines will cross the Fraser River at a point south of Ruskin, proceeding west and recrossing the river at Annacis Island. For the greater part of this 30-mile route they will be carried on separate poles. The cost of both lines is estimated at $750,000. The Burnaby substation will be considerably enlarged to cope with the additional power load at a cost of approximately $220,000. It is expected that the first of the circuits will be ready for service when the new Ruskin plant begins operation in the fall of 1930.

HOLLAND (N. J.) PLANT TO GO INTO OPERATION IN NOVEMBER.—The steam generating station for the New Jersey Power & Light Company which has been under construction at Holland, N. J., will, it is announced, be ready for operation about November 1. It will have an initial capacity of 55,000 kw., an ultimate rating of 220,000 kw. and be operated at 1,200 lb. pressure. From this source will be furnished the power with which to operate trains over a considerable portion of the electrified zone of the Delaware, Lackawanna & Western Railroad. The Holland plant will be tied into the Pennsylvania-New Jersey super power zone of the Associated Gas & Electric system. An interchange of power between this territory and the Central Hudson Gas & Electric Company of Poughkeepsie, N. Y., already in effect, and the Holland station will materially strengthen this interconnection. Another interconnection will tie in the Holland plant with the system of the Public Service Electric & Gas Company of New Jersey.

Commission Rulings

GOVERNING CONSIDERATIONS IN DECIDING WHICH OF TWO APPLICANTS SHALL SERVE COMMUNITY.—In deciding between the Ozark Utilities Company of Pleasant Hill and the Electric Utilities Company of Joplin, rival applicants for the supply of energy over a 6,600-volt line each desired to build in the same territory, the Missouri Public Service Commission was governed by the following considerations, these leading it to determine in favor of the Joplin company: Advisability of a type of rates that would encourage the greater use of electricity; the cost of extension of service to rural customers; into the territory of which applicant the district to be served fell logically and geographically, and the lack of fairness that would have inhered in being swayed by an offer by one company of a special condition to prospective customers where there was nothing in the company's rural schedule on file warranting the promise.

RATE BASE NOT DETERMINED BY INDEBTEDNESS.—In rejecting the contention of the Eastern Shore Public Service Company and the Consumers' Public Service Company that the rate base fixed for them was less than the summation of indebtedness which had been incurred with the consent of the Maryland Public Service Commission, the commission said: "While the base found in this case is not less than the companies' indebtedness, the commission cannot indorse the inference that the rate base should not be less than the indebtedness, regardless of the actual value of the property. This commission has consistently endeavored to prevent the transfer of utility properties at excessive prices and to prevent the issuance of securities in excess of real value, but as it is impracticable for the commission to thoroughly investigate and accurately value all properties before approving such transfer and security issues, it has had constantly in mind the possibility of an indebtedness being incurred in excess of property value and has incorporated in all orders authorizing the sale and transfer of utility properties the stipulation that nothing contained in the order shall be deemed, taken or construed as in any way determining the fair value of the property for rate-making purposes."

Recent Court Decisions

SUBSIDIARY UTILITY MAY CONDEMN PROPERTY EVEN THOUGH HOLDING COMPANY HAS NOT QUALIFIED IN STATE.—The West Virginia Supreme Court of Appeals has, in Shepherdstown Light & Power Company vs. Lucas, confirmed the right of the company to condemn rights-of-way on which to erect a transmission line over which it will transmit energy generated by the Potomac Edison Power Company, a Maryland corporation, which controls it, to two other subsidiaries of that company. The court holds that, even though the holding company has not qualified to do business in West Virginia, its subsidiary may do so, and also that the furnishing of energy to another public service company selling in turn to the public is a "public use" as regards the right to condemn property. (148 S.E. 487.)*

CHILD WHO TOUCHED FALLEN WIRE IN PLAY NOT A TRESPASSER.—Responsibility of public service corporations for protecting persons with "justifiable curiosity" from harm through their equipment is maintained in a decision handed down by the Supreme Court of North Carolina, which has ruled that the decision of the lower court in awarding monetary damages for the death of a child who playfully touched an unguarded electric line was in accordance with the law. The child, a girl, went to the scene of digging operations along the power-line right-of-way and touched a wire where the pole had fallen over in such a way as to leave the line close to the ground. She was instantly killed and her sister was injured. The court said that the girl was not a forcible trespasser. The case was that of Arrington vs. the Town of Pinetops and the Hookerton Terminal Company.

COMPANY RESPONSIBLE FOR DEATH FROM BROKEN RADIO WIRE WHICH HAD FALLEN ACROSS BADLY INSULATED POWER LINE.—In Culwell vs. Texas Power & Light Company damages were sought for the death of a man who grasped a broken radio aërial which had fallen across an imperfectly insulated power line belonging to the company. The defendant asserted that the radio wire had been broken in a storm and that the company had had no chance to discover and correct the hazard. Contributory negligence was alleged because the victim of the accident took hold of the broken radio wire without care or examination and because his custom of throwing waste water on the ground where he was killed made the earth damp and a dangerous conductor of electricity. The Court of Civil Appeals of Texas sustained the lower court in refusing to submit a special issue of contributory negligence to the jury and held that the evidence warranted the finding against the company. (19 S.W. [2d] 816.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

News About Electrical Men

G. H. Clifford Assumes New Executive Duties

George H. Clifford has been elected president of the Stone & Webster Service Corporation to succeed Harry H. Hunt, who has been elected chairman of the board. Mr. Clifford has been with the Stone & Webster organization for 28 years, having entered the ranks through the Northern Texas Traction Company, at Fort Worth. In less than ten years he had advanced to the managership of that company and later he was appointed district manager of the Stone & Webster properties in the Southwest. Two years ago he was brought into the Boston office to become division manager of that district and of the Virginia Electric & Power properties, which position he held up to the time of his present promotion.

CHARLES L. CAMPBELL, secretary and treasurer of the Connecticut Light & Power Company, Hartford, Conn., since that utility was organized, has been elected a vice-president. Mr. Campbell was also elected a vice-president of the Connecticut Electric Service Company.

ARTHUR WILLIAMS, formerly vice-president of the New York Edison Company, has returned to America invigorated by a stay of several months across the Atlantic, principally in France, where he went for the rest and change of a European vacation.

HENRY G. RICHTER was elected vice-president in charge of engineering of Electrad, Inc., New York, and EDWARD METZGER vice-president and general manager in charge of credits, general office and factory supervision at a meeting of the board of directors held October 15.

DR. IRVING LANGMUIR, associate director of the research laboratory of the General Electric Company and president of the American Chemical Society, was the guest of honor at a luncheon given by the New York and New Jersey sections of the American Chemical Society and the Chemists' Club October 19. After the luncheon Dr. Langmuir made an address on chemical reactions produced by heating tungsten or platinum filaments in gases.

DR. JOHN R. HAYNES has been elected president of the Board of Water and Power Commissioners of the city of Los Angeles to succeed former Judge Harlan G. Palmer, who resigned as head of the board, although retaining his membership. Mr. Palmer then was elected vice-president in place of Dr. Haynes, who had been elevated from that office, the two exchanging positions.

OWEN D. YOUNG, chairman of the board of directors of the General Electric Company, has been appointed to membership on the Committee of the American Peace Award, which advocates the adherence of the United States to the Permanent Court of International Justice on the terms of the new protocol embodying the formula worked out by Elihu Root.

L. E. Baldwin Removes to Kansas

L. E. Baldwin, formerly head of the engineering department of the Florida Power Corporation, at St. Petersburg, Fla., has been appointed chief engineer of the United Power & Light Corporation, with headquarters at Abilene Mr. Baldwin has had many years of experience in public utility engineering, and is fully capable of dealing with the problems he will encounter on this property. In his former position with the Florida Power Corporation, he was prominently identified with the large construction programs which were put on as a result of the recent real estate booms. Although he has been away for a number of years, Mr. Baldwin is a native of Kansas.

BERNARD F. BRAHENEY has been elected a vice-president of Byllesby Engineering & Management Corporation. Mr. Braheney has been with the Byllesby organization since 1910, beginning as a clerk in the auditing department of the Northern States Power Company. He later held positions in the auditing departments of other Byllesby properties until 1920, when he was made assistant general auditor of the Byllesby organization with headquarters in the Chicago office. Since 1923 he has been general auditor.

Obituary

MERRILL L. HARRY, aged 51 years, for a quarter of a century identified with the McKinley utility interests in Decatur, Ill., and general manager for the central Illinois group of the Illinois Power & Light Corporation, which acquired those interests, was fatally injured at midnight, October 11 in an auto accident and died two hours later. Mr. Harry was born June 8, 1878, in Bay City, Mich., where his father established an electric light plant and later a traction system, in which the young man obtained his first practical knowledge of utilities operation. His first association with the McKinley interests was in Danville in a minor capacity and he advanced until he became assistant to the manager. When the Decatur traction lines were acquired by the McKinleys Mr. Harry was placed in charge as manager early in 1904. He had been associated with central Illinois utilities operation continuously since that time. At one time he was identified with the railway branch of the industry, but as the power and light activities increased he was transferred to that phase of utility work. Six years ago, when the Illinois Power & Light Company took over the Decatur properties, he became division manager and three years ago was made general manager in charge of properties in Decatur, Bloomington, Peoria, Champaign, Urbana, Danville and the intermediate communities.

JOHN WENDELL ROBINSON, central-station manager of the northwest district of the Westinghouse Electric & Manufacturing Company, recently succumbed to heart trouble. Mr. Robinson had been with the sales organization of the Westinghouse company for 23 years. He started in 1906 as a lamp salesman in the Milwaukee office and then worked in the detail and supply sales, general sales, railway and lighting sales and central-station sales departments, all in the Milwaukee office. Since 1922 he had been central-station sales manager of the northwest district.

FRANK HENDERSON, manager of the Cleveland office of the Combustion Engineering Corporation, died suddenly September 25, in his fifty-third year. He was born at Tuscola, Ill., and joined the Green Engineering Company in 1898. He worked his way up in that organization as service man, tester and superintendent of service work. In 1922, when the Green Engineering Company was absorbed by Combustion Engineering Corporation, Mr. Henderson, who was then managing the Cleveland office, became the district manager for the Combustion Engineering Corporation, in which position he continued until his death.

HENRY C. HOUCK, manager of the merchandise department of the General Electric Company, died at his home in Bridgeport, Conn., October 15 after a long illness. Educated at Phillips Exeter Academy and the University of Pennsylvania, from which he was graduated in electrical engineering in 1899, he entered the employ of the General Electric Company in the fall of that year. In his 30 years of service with the company Mr. Houck filled many important positions at Schenectady, Cleveland and Cincinnati, as well as at Bridgeport, where he became manager of the merchandise department in December, 1925.

Financial and Statistical News

UTILITY STOCKS bore the brunt of the drastic liquidation more than any other single group. Ten leading high-priced utility common stocks sold down 77 points on the average from the year's high. These included Electric Investors, down 122 points; American Gas & Electric, down 95 points, and Commonwealth Edison, down 84 points (to October 23).

——THE LIQUIDATION MOVEMENT also caused heavy selling of the newer utility investment trust stocks, some of which were forced down below the issue price.

——MONEY HAS BEEN EASIER during the past fortnight than at any time in two years, due partly to the Reserve Board's purchases of acceptances, partly to the inflow of gold and partly to the flow of funds from interior banks. This latter process, however, is subsequently reversed due to the unattractiveness of rates in New York. That such a process has taken place is suggested by the drop in trading volume in the leading markets.

Withdraw Offer Made for Pacific Properties

The recent offer of the Public Utility Holding Corporation of America to acquire stock of the Southern California Edison Company, Pacific Lighting Company, Pacific Gas & Electric Company and National Fuel Gas Company has been withdrawn, according to an announcement from the company's offices.

The terms of exchange, as originally announced, called for an exchange of one share of Southern California Edison against two shares of Public Utility Holding common with warrants attached and one detached warrant; for one share of Pacific Lighting against two shares of Public Utility Holding common with warrants attached and two detached purchase warrants; for one share of Pacific Gas & Electric against two shares of Public Utility Holding with warrants attached and two detached warrants. The warrants entitle the holder to purchase Public Utility Holding common at $30 a share.

Stocks Should Sell Higher as Dollar Buys Less

Prof. Irving T. Fisher of Yale told the New York Credit Men's Association one justification of higher security price levels which is usually overlooked. He said:

"The dollar has now only two-thirds the purchasing power of the pre-war dollar. That alone would account for an increase of 50 per cent in the level of the stock market.

"Other factors are mergers, scientific management, co-operation between labor and management, prohibition, which makes labor more productive and dependable, and finally, common stocks have become popular as investments and share in earnings in increasing measure, due to the depreciated dollar.

"While the index of prices of representative stocks has risen very rapidly during the past year, it has risen more slowly than the rate of total earnings, comprising those earnings distributed in dividends and those retained for plowing back into the industry. It is this factor of the increased rate of total earnings that should be emphasized in any appraisal of the present stock market.

"During the past six years there have been pronounced changes in the tempo of production and trade, due to the vast increment of scientific research and application of inventions in virtually every line of manufacture."

American Superpower Issues Preferred Stock

First preferred stock, $6 series, of the American Superpower Corporation has been offered to the investing public to the amount of 100,000 shares. The price of this stock was $99 a share and accrued dividends, to yield over 6.05 per cent. This public offering calls attention to the fact that the company has recently acquired substantial blocks of stock in the Niagara Hudson Power Corporation and in the Consolidated Gas Company of New York. The last previous list made public did not contain the names of these holdings, which follow immediately after the company investments in Commonwealth & Southern Corporation, the United Corporation and in the Electric Bond & Share Company, in the first two of which the American Superpower is the largest corporate stockholder.

PACIFIC LIGHTING TO SPLIT STOCK.—Common-stock holders of the Pacific Lighting Corporation will shortly be offered the right to subscribe to additional stock following a split-up of the shares. While details of the financing have not been worked out, it is understood that the split-up will be on a two-for-one basis and that the new stock will be placed on an annual dividend basis of $2 a share.

Investment Bankers Deplore Speculation in Securities

IT IS time to call a halt on wildcat buying of securities and the speculative activities which have boosted prices to almost unprecedented levels, according to the committee on public service securities of the Investment Bankers' Association. Several other phases of the financial situation were dealt with by the bankers in session at Quebec, including stock dividends and regulation of investment trusts.

The report of the committee on public service securities took the position that no unnecessary federal authority should be set up to supervise the activities of the public utilities, but that the state authorities should handle the matter.

Relative to spectacular market activities, the committee stated it to be its opinion that it could do no greater service than to caution against speculative and uninformed buying and to counsel the prudent buying of public utility securities. The report said in part: "The speculative rise of the investment trust in this country will receive due consideration from another committee, but mention of the influence of the investment trust on the utility securities is too important for the committee to ignore. With almost $2,000,000,000 poured into the capital investment trusts this year alone," the report went on, "and with probably over $3,500,000,000 now at their disposal, their influence on the market has become very important. Investment has been chiefly in stocks in the ratio, perhaps, of twelve or more to one against bonds.

"This buying has acted as a bellwether to the crowd. The problem is as to what the effect of this new market influence on utilities, as well as other securities, will be, should a real stock market liquidation set in."

TOO MUCH REGULATION HARMFUL.

Discussing the possibilities of over-regulation of the utilities, the report said:

"It is to be hoped that such inaccuracies and the urge to act will not influence either state or federal authorities to hasten the enactment of restrictive legislation.

"We have many examples of the evils of over-regulation by the government

in other fields, and it is difficult to see how the one important factor in this field, namely, the management, can be obtained by regulation."

The report of the committee condemned the policy of some investment trusts for failure to disclose their holdings, "although there are some cases where good reasons exist," said the report, "for not publishing complete lists of holdings. In the majority of cases, the stock exchange requirements for complete publication of the lists of such holdings tends to go a long way toward correcting such evils as now exist.

"The inflation of prices referred to has occurred chiefly in the shares of those companies which have given little or no information.

"Generally speaking, our conclusions are : (1) That the majority of the larger well-managed investment trusts are today soundly set up and in the hands of capable, conservative managements, which fully recognize their responsibilities. These companies have made great progress during the past year and are in a position to withstand the turn in the market which is bound to come sooner or later. (2) That holding companies, finance companies, trading companies, etc., while each may be perfectly good in the hands of proper management, should not be confused with the newer, well-diversified investment companies. (3) That we see nothing constructive to be gained in the present situation by regulatory action aimed at this particular field, believing, as we do, that such evils as inflation of prices which probably exist in other fields to an equally great extent will be best remedied by natural economic laws and increased willingness on the part of managements to give adequate information such as is required by the New York Stock Exchange.

"And, finally, we urge, more than ever before, that at this time investors and dealers alike scrutinize each security from the point of view of both value and management."

A severe criticism of corporations which declare stock dividends periodically when actual growth of earnings has not taken place to a corresponding degree was made by Waddill Catchings of Goldman, Sachs & Company, chairman of the committee on industrial securities. This report on stock dividends will be discussed in detail later.

Notable Gains in August Operations

Energy Output Breaks All Records, Amounting to 7,869,076,000 Kw.-Hr.—Month's Revenue $163,700,000—Each Exceeds Last Year's Record by 10.4 per Cent

MORE than the normal seasonal increase in the operations of electric light and power companies is shown in the returns for August received by the ELECTRICAL WORLD. The revenue, estimated at $163,700,000 for the entire country, is $5,000,000 greater than that for July and $15,500,000, or 10.4 per cent, greater than that for August, 1928. The operating expenses, rising 7.5 per cent above the corresponding amount a year ago, came to $71,550,000.

The energy output exceeded that of July by more than 200,000,000 kw.-hr., while the year's gain was about 741,000,000 kw.-hr., which also is a gain of 10.4 per cent, bringing the month's total to 7,869,076,000 kw.-hr., the largest output ever recorded in any month. It might be noted in passing that the corresponding figure for all public utilities in the United States, also compiled by the U. S. Geological Survey, is 8,259,426,000 kw.-hr. Comparison shows, therefore, that roughly 400,000,000 kw.-hr., or about 5 per cent of the total, is generated by non-central station plants, chiefly those producing energy for the operation of electric railways and electrified railroads.

The changes in revenue and operating expenses in recent months and also in the corresponding months last year are shown in Table I.

While the energy output was materially greater than in July, the amount contributed by water power shows a serious falling off, to the extent of about 240,000,000 kw.-hr. This scarcity of water affected the entire country; comparison shows that not a single section escaped. The effect was particularly severe in New England. Further, while the total energy output was far greater than in the corrresponding month last year, the energy generated from water power was smaller by 7.2 per cent. As a result of this condition the fuel-burning plants were required to deliver an output not only greatly exceeding that of July, but overshooting their output for August, 1928, by more than 900,000,000 kw.-hr. Their contribution constituted 65 per cent of the entire output.

Of the nine sections into which the country is divided for general statistical

Neighboring Regions Sent Power to Meet Hydro Deficiency in Southern Seaboard States

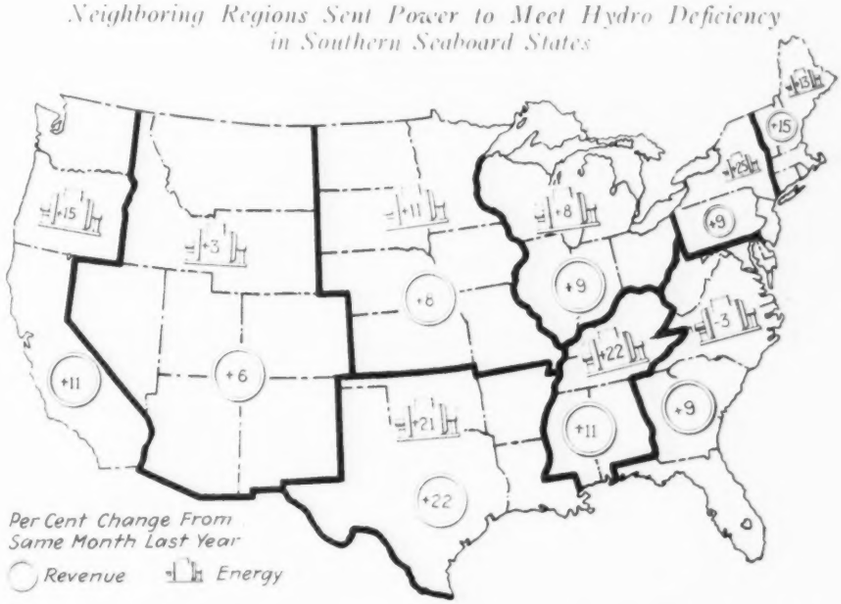


Table I—Central-Station Financial Operations in the United States

Compared with Corresponding Month of Previous Year

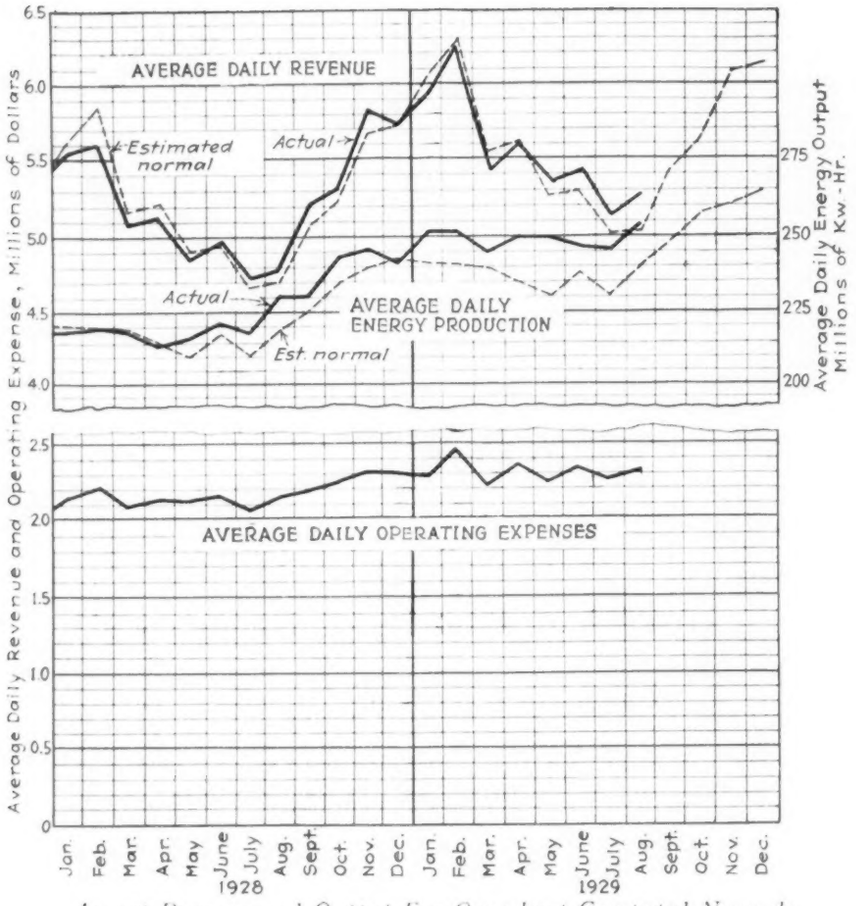
Month	Total Gross Revenue from Sale of Energy*			Total Operating and Maintenance Expense†		
	1929 Thousands	1928 Thousands	Per Cent Inc.	1929 Thousands	1928 Thousands	Per Cent Inc.
May	$165,600	$150,100	+10.3	$71,300	$65,700	+8.5
June	162,500	149,500	+ 8.7	69,900	64,800	+7.9
July	158,700	146,600	+ 8.3	69,900	64,100	+9.1
August	163,700	148,200	+10.4	71,550	66,600	+7.5

Table II—Central-Station Fuel Consumption in the United States‡

Compared with Corresponding Month of Previous Year

Month 1929	Coal		Oil		Gas	
	Short Tons	Per Cent Increase	Barrels	Per Cent Increase	Thousands Cubic Feet	Per Cent Increase
May	3,096,874	+ 9.7	566,953	+22.8	8,485,388	+48.0
June	3,136,366	+13.9	585,784	+22.8	8,804,287	+41.4
July	3,316,809	+15.3	670,738	+26.4	8,845,669	+27.0
August	3,584,358	+13.9	752,406	+27.6	10,115,576	+32.2

*Aggregate gross revenue from consumers and from other utilities for energy for resale, involving a certain amount of duplication.
†Do not include interest, taxes, depreciation or sinking fund, with some unavoidable exceptions. ‡As collected by U. S. Geological Survey.



August Revenue and Output Far Overshoot Computed Normals

purposes, only two, the East South Central and the Pacific States, report an output from water power exceeding that of August, 1928. The heaviest loser was New England, with a decrease of 39 per cent.

As might be expected, the output from fuel shows the most striking gain in sections making large use of water power. New England, the South East and the West. The details are apparent from Table IV.

Table III—Energy Output of Central Stations in the United States

Compared with Corresponding Month of Previous Year

Month 1929	Generated, Thousands of Kw.-Hr.*						Purchased for Resale	
	Total		Hydro		Fuel			
	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Thous. Kw.-Hr.	Per Cent Inc.
May	7,706,345	+14.6	3,395,320	+10.5	4,311,023	+18.1	1,571,000	+8.5
June	7,406,772	+11.6	2,984,597	−0.8	4,422,175	+21.9	1,565,000	+6.1
July	7,646,165	+13.0	2,975,371	−0.1	4,670,794	+23.4	1,610,000	+8.2
August	7,869,016	+10.4	2,737,879	−7.2	5,131,137	+22.8	1,630,000	+8.2

Table IV—Regional Operations, Revenue and Energy Output in August, 1929

Compared with Corresponding Month of Previous Year

Region	Revenue		Energy Generated Thousands of Kw.-Hr.*					
			Total		Hydro		Fuel	
	Thousands of Dollars	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.	Generated	Per Cent Inc.
United States	163,700	+10.4	7,869,016	+10.4	2,737,879	−7.2	5,131,137	+22.8
New England	15,960	+15.1	501,019	+13.4	116,515	−39.0	384,504	+53.4
Middle Atlantic	40,130	+9.0	1,882,291	+25.3	440,884	−14.6	1,441,407	+29.6
East North Central	41,190	+9.1	1,864,764	+7.9	173,458	−9.4	1,691,306	+10.0
West North Central	13,740	+7.5	479,071	+11.2	120,129	−16.4	358,942	+25.0
South Atlantic	17,040	+8.8	894,781	−2.7	411,910	−20.8	482,871	+20.6
East South Central	5,890	+11.2	293,123	+22.3	220,632	+13.6	72,491	+58.9
West South Central	9,110	+22.5	448,611	+20.5	2,777	−27.1	445,834	+21.0
Mountain	4,440	+6.0	339,231	−2.8	282,091	−10.6	57,140	+70.0
Pacific	16,200	+11.2	1,166,125	+14.7	969,483	+11.1	196,642	+37.1

*As collected by U. S. Geological Survey.

The effect on fuel consumption was inevitable. Aside from the increased use of oil and natural gas, about 270,000 more tons of coal were burned than in July and 440,000 more than a year ago. (Table II.)

Some unusual regional gains in revenue are revealed by Table IV. That for New England, 15.1 per cent, will probably be considered the most striking, although it is not the largest. The maximum increase, 22.5 per cent, occurred in the West South Central States, which, both in revenue and in energy output, reveal a continuation of that remarkable electrical progress to which attention has been called in connection with reports for previous months.

For a comparison of the energy output of fuel-burning plants in recent months the following figures should be substituted to take the place of those appearing in the next to the last column of Table IV on page 664 of the issue of September 28:

Energy Generated from Fuel in July

	Thousands of Kw.-Hr.
United States	4,663,269
New England	336,362
Middle Atlantic	1,317,804
East North Central	1,594,887
West North Central	311,892
South Atlantic	425,726
East South Central	55,678
West South Central	420,666
Mountain	52,448
Pacific	147,872

Memphis Utility to Issue Stock.—Application of the Memphis Power & Light Company to issue and sell 10,000 shares of preferred stock has been granted by the Railroad and Public Utilities Commission of the State of Tennessee, meeting in Nashville. The stock will be sold to the public for not less than $100 a share and to employees at not less than $95. Proceeds from the sale of the stock will be used for discharging financial obligation of the company in connection with improvements to the company's electric and gas plants and distribution system.

Niagara Hudson Output.—Electric output of the Niagara Hudson Power system for September, 1929, was 571,000,000 kw.-hr., compared with 504,000,000 kw.-hr. last year, a gain of 13.3 per cent. For the twelve months ended September 30 there was a gain of 509,000,000 kw.-hr., or 8.2 per cent, over the corresponding period ended September 30, 1928. In the twelve months up to September 30 production of Niagara Hudson companies totaled 6,735,000,000 kw.-hr., as against 6,226,000,000 kw.-hr. for the preceding twelve months. Most of the added output in September was in steam-generated energy, due to new steam installation, to the economies being effected in steam-electric generation and to the continuance of low water conditions throughout much of the state, but there was at the same time substantial hydro-electric increase.

Business News and Market Conditions

Seasonal Increase in Manufacturing

A SEASONAL upward trend in the rate of operations was witnessed during September by the electrical manufacturing plants of the country, according to reports on the consumption of electrical energy received by the ELECTRICAL WORLD. September operations, after corrections are made for number of working days, were 8.6 per cent above those reported for August and 20.1 per cent above September last year. The increase of September over August was not as large as was witnessed for the same months last year, but after such a continued high rate of activity throughout the summer months a corresponding increase this year was hardly to be expected. The average rate of productive activity during the first nine months of the current year was 27.1 per cent greater than during the same period last year. There seems to be every evidence now that the operations of the industry will remain on a comparatively high plane during the remaining months of the year.

The reports on electrical energy consumption indicate that the larger manufacturing companies are maintaining their productive operations in a better position than the group of smaller companies. The larger companies recorded an average increase in operations of 7 per cent as compared with August and were operating on a plane 47.3 per cent above September last year. On the other hand, the smaller electrical manufacturing plants recorded an increase in the rate of operations of 9.3 per cent as compared with August, slightly above the increase recorded by the larger plants, but were operating at a rate only 28.7 per cent above September last year.

The index of activity in the electrical manufacturing industry, based on consumption of electrical energy, stands at 168.8 for September as compared with 140.5 in September last year. Comparative indexes of productive activity referred to the average activity for the period 1923-25 as 100 and adjusted for number of working days are shown in the following table:

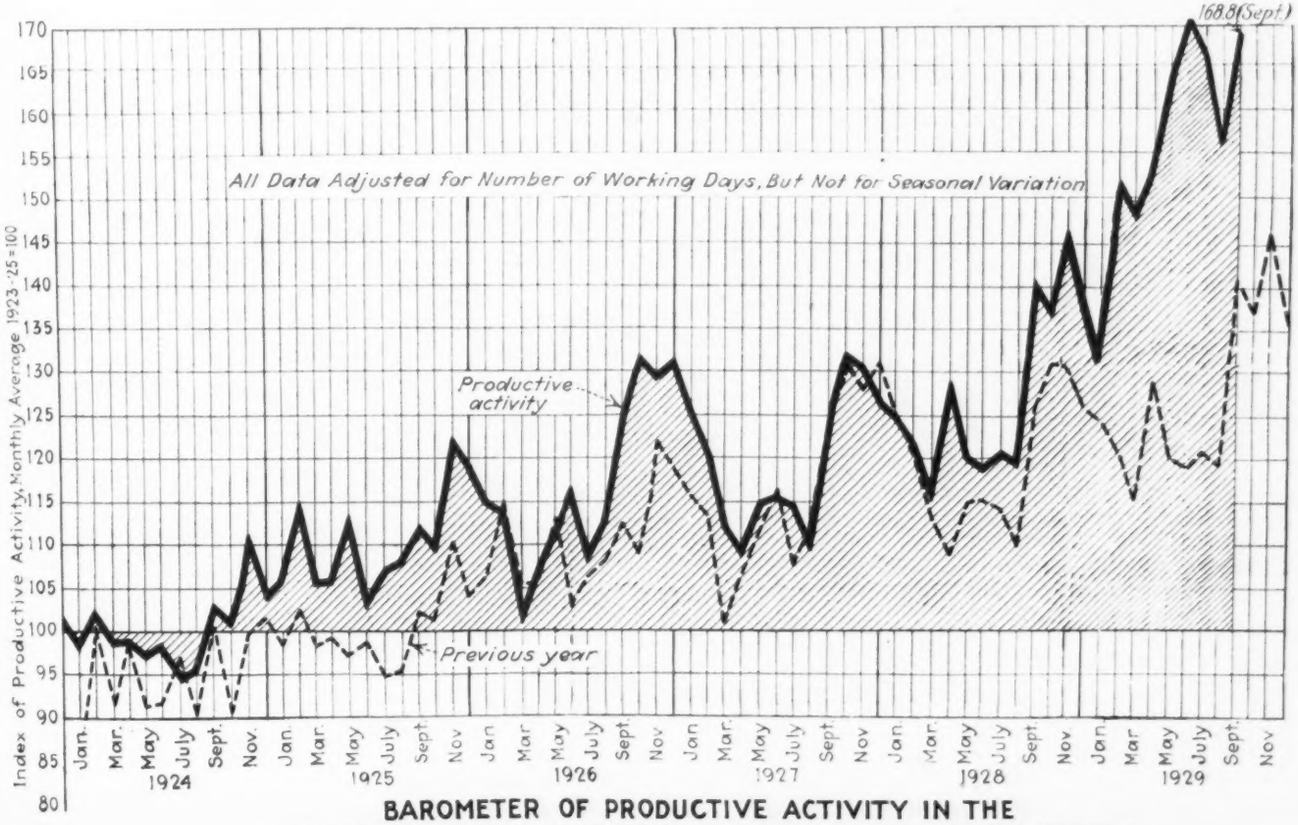
September, 1929	168.8
August, 1929	155.4
July, 1929	166.6
June, 1929	170.7
September, 1928	140.5
Average first nine months 1929	156.7
Average first nine months 1928	123.3

Tentative Standard for Flatiron Cord

RECOMMENDATION that a tentative standard for flatiron cord should be adopted immediately was made by the technical committee of the heating appliance section, National Electrical Manufacturers' Association. It had previously been arranged to enlarge the industry conference to include the complete cord set, but as a result of discussion it developed that considerable time would be required to work on a thorough standard for cord sets in view of the many elements involved.

With regard to the Underwriters' Laboratories standard of 1,000 cycles, it was agreed that while this is satisfactory for the appliance it is not satisfactory for flatiron cord. Most flatirons sold, in fact, are being supplied with a much higher standard of cord. Consensus of opinion after full discussion was that a minimum of 3,000 cycles on the Underwriters' cord testing machine should be adopted as soon as possible. Recommendation to this effect was made to the industry conference to hold good until such time as a more complete standard can be worked out and agreed upon.

The question of identification of flatiron cord was brought up and it was pointed out that the heater cord manufacturers were prepared to supply heater cord in lengths with a suitable under-



BAROMETER OF PRODUCTIVE ACTIVITY IN THE ELECTRICAL MANUFACTURING PLANTS OF THE UNITED STATES

writers' label every 5 ft., so that when the cord is put up in lengths for flatirons or appliances there would be one label on each individual length. Such labels could be used to distinguish flatiron cord from appliance cord. The discussion brought out the importance of identifying cord having underwriters' approval as a means of educating and protecting the trade and the public.

UNDERWRITERS' LABORATORIES APPROVAL

Attention was drawn to the fact that the large majority of the dealers handling electrical appliances are not aware that standard manufacturers make a practice of submitting appliances to the Underwriters' Laboratories for approving and listing. It was thought also that those who do know about it in a general way may not realize the value of such a practice as setting up a minimum standard of quality from a standpoint of casualty and fire hazard. The opinion was expressed that the trade press can do a great deal in educating the dealers to the importance of each standard division and in this way eliminating material of substandard quality.

Market Conditions

IRON AND STEEL mills and other branches of the metal-working industries are important buyers of electrical equipment at the moment in the Eastern district. Manufacturers regard the outlook for the next 30 or 60 days as decidedly good. Hydro construction and transmission programs are being rushed in parts of New England.

——HEATING AND COOKING APPLIANCES are unusually active in the Southwest.

——RAILROAD BUYING is still a feature in the Middle West.

——POWER COMPANY BUSINESS has quieted down on the Pacific Coast, but heavy business is anticipated in transformers, switches and motors.

MIDDLE WEST

VOLUME of business has increased gradually and all indications point to a continuation of good business. The major activities, with the possible exception of the automotive industry, are in excellent shape, and while car loadings are off somewhat, this condition is not expected to continue long. Retail trade is receiving the stimulus of fall buying. The various railroads are contributing substantially to the general good conditions through their equipment purchasing.

There has been a substantial demand for apparatus and distribution equipment. Among the interesting orders placed this week are the following items: Two standard and one reheat steam-generating units valued at $1,500,000, precipitators for three boilers complete with appurtenances valued at $165,000, 21 oil-circuit breakers, 600 amp., 15 kv., single-pole, single-throw, wheel-mounted, solenoid-operated; one Rex traveling water screen, 600 g.p.m. capacity, 3,000 5-amp. watt-hour meters, 455 Thompson meters, 10 to 3,000 amp. capacity, 84 current transformers, 150 to 4,000 amp. capacity, and construction orders aggregating $150,000.

Jobbers' sales are increasing with general business. Considerable business is being obtained from the coal mining sections, while railroad purchasing has been substantially good. Construction projects follow:

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., plans steam-operated electric power plant at Port Washington, Wis., to cost $7,500,000. Allis-Chalmers Manufacturing Company, West Allis, Wis., plans addition to machinery plant to cost $1,500,000, and will build addition to tractor plant at Springfield, Ill., to cost $500,000. La Crosse, Wis., contemplates an ornamental street-lighting system. Northern States Power Company, Eau Clair, Wis., will build a transmission line from Cuba City to Darlington, Wis., to operate at 33,000 volts. Ford Motor Car Company, Highland Park, Detroit, Mich., plans, automobile assembling plant at Cologne, Germany, to cost upward of $750,000. Consumers Power Company, Jackson, Mich., plans additions in power plant at Milwaukee, Mich., to cost $700,000, including coal storage and distributing facilities. Snap-On Wrench Company, Chicago, Ill., is completing plans for a plant at Kenosha, Wis., to cost $180,000. Brasco Manufacturing Company, Chicago, Ill., will build metal store front manufacturing plant at Harvey, Ill., to cost $150,000. Kraft-Phenix Cheese Company, Chicago, Ill., will build an addition to plant at Beaver Dam, Wis., to cost $90,000. Central Illinois Public Service Company, Springfield, Ill., plans power substation at Rosiclare, Ill., to cost about $50,000. Newcastle, Ind., plans installation of floodlighting system and beacon lamps at proposed municipal airport to cost $100,000. Indiana University, Bloomington, Ind., has plans for a chemistry building to cost $400,000. Youngstown Pressed Steel Company, Warren, Ohio, will make additions and improvements in mill to cost about $500,000. Middletown, Ohio, plans installation of floodlighting system and beacon lamps at proposed municipal airport to cost $110,000. Shell Petroleum Company, St. Louis, Mo., plans oil storage and distributing plant at Toledo, Ohio, to cost about $2,000,000. Rubel Baking Company, Cincinnati, Ohio, will build an addition to cost $240,000. Federal Tile Company, Columbus, Ohio, will build an addition to cost $100,000. General Motor Transportation Company, Dayton, Ohio, will build a truck terminal to cost $200,000. Midwest Canning Company, Rochelle, Ill., plans food product canning plant at Sleepy Eye, Minn., to cost $250,000. Ottumwa, Iowa, plans municipal hydro-electric power plant to cost $750,000.

PACIFIC COAST

POWER COMPANY business is lighter, though it is estimated that nearly $2,000,000 worth of transformers alone will be bought in California before next January. Industrial business, especially for packing and lumber plants, is good, both for machinery and wiring supplies. Contractors' business is also good, with enough new jobs in sight to carry on through winter.

Machinery orders include two General Electric elevator equipments for San Francisco, three General Electric 1,500-kva., 66,000-volt transformers worth $20,000 for the Turlock irrigation district, $15,000 worth motors, fuses and switches for a packing company, two Westinghouse turbo-generators, valued $25,000, for a government transport, and a 3,000-sq.ft. Westinghouse condenser valued at $15,000 for a lumber company. Power company material includes a carload of high-tension insulators for central California and two carloads of ranges, the latter through a Seattle jobber. Manufacturers report that motor sales are quiet, but that the usual seasonal or secondary spurt of transformer sales is extraordinarily heavy, with local warehouses working to capacity to cope with the demand. KGO, the General Electric station, is to be moved from Oakland to a 50-acre tract near Belmont, and plans are afoot to make it the world's most powerful station. Projected construction includes a $350,000 high school for Santa Cruz, a $2,000,000 bond issue to cover a Diesel engine generating plant for an Imperial Valley irrigation district and airports for Alameda and San Mateo, the latter also covering a government instruction school.

Motor and apparatus sales in the Puget Sound area last week were very light with no immediate prospect for improvement. Several authorities state that heavy buying of motors by lumber mills, predicted for fall, will not materialize until after the first of the year. Other electrical lines, with the exception of lamps, ranges, certain domestic appliances and heating devices, are moving slowly. Granting a license to the Washington Electric Company of Seattle, a subsidiary of the Puget Sound Power & Light Company, by the Federal Water Power Commission last week

means start of early construction on an ultimate 84,000-hp. development at Rock Island, on the Columbia River. The first unit, A. W. Leonard, president, stated, will cost between $10,000,000 and $12,000,000. The General Electric Company received a contract for overhauling electric turbines in the airplane carriers Saratoga and Lexington, now at Puget Sound Navy Yard, Bremerton, involving about $200,000. The city of Seattle opened bids for ten one-mile reels of hard-drawn copper trolley wire. The St. Paul & Tacoma Lumber Company, Tacoma, plans construction of an electrified saw and shingle mill in Bellingham. Construction projects follow:

Southern Sierras Power Company, Riverside, Calif., will build a power substation at Palm Springs, and will construct transmission line to that point from Banning, Calif., estimated to cost $120,000. Whitlock Manufacturing Company, Los Angeles, Calif., will build a mail-metering machine manufacturing plant to cost about $130,000. General Motors Corporation, Detroit, Mich., is reported planning automobile assembling plant at Los Angeles, Calif., to cost more than $3,000,000. Pacific Gas & Electric Company, San Francisco, Calif., has filed plans for an equipment storage and distributing plant, including repair department, to cost $275,000. Readymix Concrete Company, San Francisco, Calif., plans mixing storage and distributing plant to cost $100,000. The Oliver United Filters Company, Oakland, Calif., will build a filtering equipment manufacturing plant at Fruitvale, Calif., to cost $500,000. Sacramento and San Luis Obispo, Calif., plan ornamental lighting systems. Simpson Logging Company and McCleary Timber Company, Shelton, Wash., plan central steam-operated power plant at Shelton for joint factory service, including 18-mile transmission line and substation to cost $100,000. Utah Poultry Producers Co-operative Association, Salt Lake City, Utah, plans packing house and refrigerating plant to cost $150,000. Southern Colorado Power Company, Pueblo, Colo., plans power plant at Westcliffe, Colo., reported to cost more than $85,000. Yuma, Ariz., plans ornamental street-lighting system.

SOUTHWEST

IN SPITE of a certain amount of depression in building construction and some other lines of business the demand for industrial sizes of motors, transformers and switching equipment continues exceptionally good. Seasonal volume of business in heating and cooking appliances up to date has been well above normal.

A contract was closed for a condenser of 15,000 sq.ft. surface by a southwest power company to cost about $50,000. Contract was also closed for a surface air cooler for the same plant, this item to cost $4,000. Some other sizable jobs have been figured in the past week but not closed. Construction projects follow:

Guardian Aircraft Company, St. Louis, Mo., plans plant at Moberly, Mo., reported to cost $85,000. Goebel Aviation Company, Kansas City, Mo., plans installation of floodlighting system and beacon lamps at proposed airport at Liberty, Mo., entire project to cost $85,000. St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo., plans transmission line from Savannah to Oregon, Mo., with substation facilities at latter place. Campbell, Mo., is having plans prepared for a municipal electric light and power plant reported to cost in excess of $80,000. Chicago, Rock Island & Pacific Railroad Company, Chicago, Ill., will build a car repair shop at Kansas City, Kan., to cost about $75,000. Dodge City Terminal Elevator Company, Dodge City, Kan., will build a grain elevator to cost $100,000. Tulsa, Okla., plans installation of floodlighting system and beacon lamps at proposed municipal airport, estimated to cost $600,000. Camden, Ark., plans ornamental street-lighting system. Port Arthur, Tex., plans installation of floodlighting system and beacon lamps at proposed municipal airport. Imperial Sugar Company, Sugarland, Tex., plans power plant at sugar refinery to cost about $75,000. Waco, Tex., plans extensions in ornamental street-lighting system. Bogalusa, La., will receive bids until November 5, for an ornamental lighting system. Louisiana Steam Products, Inc., Baton Rouge, La., recently organized, plans steam-electric generating plant to cost more than $5,000,000.

SOUTHEAST

ELECTRICAL activities in the Southeast in the past week were quieter than for several weeks past, with the general volume of business slightly off. Some activity is to be noted in and orders are anticipated from Louisiana and Mississippi on account of industrial expansion and flood control work.

One power company last week ordered $5,700 in creosoted pine poles and $1,100 in pole line hardware, while its crossarm purchases in the past ten days aggregated $6,400. Another central station order reported was for battery equipment amounting to $3,650. The city of Atlanta last week let contracts for a 180-standard extension to its "white-way" system. Some interesting commercial orders placed recently were for $17,500 in electric individual bottle cooling units, purchased by a mineral water company for rental, and a $3,600 sign order placed by a hotel in Atlanta. Construction projects follow:

Barium Reduction Corporation, Charleston, W. Va., plans sodium sulphate plant at Horseshoe Lake, near Ormiston, Sask., to cost about $200,000. Covington, Tenn., will build an industrial high school to cost $100,000. Jackson, Tenn., contemplates a municipal electric light and power plant to cost more than $500,000. Second National Garage, Inc., Nashville, Tenn., has plans for a multi-story automobile service, repair and garage building to cost $500,000. Planters Package Company, Crystal Springs, Miss., has approved plans for a power plant, veneer mill and box factory to cost $200,000, replacing works recently destroyed by fire. National Portland Cement Company, Vicksburg, Miss., plans mill to cost $1,000,000. Mississippi Power Company, Gulfport, Miss., plans power substation at Maxie, Miss., and will extend transmission lines from Poplarville to Lumberton, Maxie and vicinity, to operate at 44,000 volts. Gulf Utilities Company, Monroeville, Ala., plans extensions in transmission lines to Uriah, Ala., and vicinity. Birmingham Terminal Company, Birmingham, Ala., will build an addition to terminal plant to cost $100,000. Foremost Dairy Products Company, Jacksonville, Fla., plans milk plant at Atlanta, Ga., reported to cost $350,000. Board of Commissioners, State Institutions, Tallahassee, Fla., will receive bids until Nov. 5, for a Diesel engine generating unit.

EASTERN

INDUSTRIAL demand shows an upward trend, with a large group of basic lines of manufacture sharing in the call. Central stations are placing sizable contracts, with prime movers developing increased interest. Railway electrification is still calling for a good quota of equipment.

Iron and steel mills, including other branches of the metal-working industries, are important factors in current market call and a heavy volume of business is maturing. A Pennsylvania manufacturer has secured a contract for main roll drives and equipment for a structural steel mill in the Chicago district, totaling $1,250,000, including a motor-generator unit and accessories. Chemical plants, paper mills, leather tanneries and radio equipment factories are placing sizable commitments for motors and controls.

Advance projects of extensive character show particular diversification in impending equipment needs. The Safe Harbor Water Power Corporation, a subsidiary of the Pennsylvania Water & Power Company, Baltimore, Md., has plans maturing for a hydro-electric generating plant on the Susquehanna River at Safe Harbor, near Holtwood, Pa., to cost about $30,000,000. The Kitsap County Transportation Company, San Pedro, Los Angeles, Calif., will soon take bids for two Diesel engine-drive ferry boats, to cost $530,000. The Pennsylvania Railroad Company has concluded arrangements with the City of Baltimore, Md., for the electrification of its lines in that municipality, to cost $22,000,000.

Business from utility companies shows a decided trend towards heavy machinery, with sizable awards for equipment for hydro-electric power service. A power company in New Jersey has placed a contract with a New York manufacturer for circuit breakers, totaling more than $50,000. A manufacturer of high-tension insulators reports expanding account and has taken an award for an important transmission line in Mississippi, the line hardware being furnished by a Chicago manufacturer. Wire and cable account shows improved status, and actual commitments are increasing. A manufacturer of insulated wire in Connecticut is operating on a day and night schedule, with full working force, and will hold to this basis for an indefinite period. A producer of electric wiring devices in New Jersey is securing record orders and the seasonal demand for future commitments

is stated as excellent. Construction projects follow:

American Tobacco Company, New York, has plans for a plant addition at Richmond, Va., to cost $2,500,000. Kohler Company, New York, with headquarters at Kohler, Wis., will build a factory branch and distributing plant for sanitary ware at Long Island City, to cost $230,000. Signal Supply Officer, Signal Section, New York General Depot, Brooklyn, N. Y., will receive bids until Nov. 12 for switchboards (Circular 54); until Nov. 5, for radiotelegraph transmitters (Circular 53); and until Nov. 5, for 450 voltmeters (Circular 51). New York Central Railroad Company, New York, has filed plans for a multi-story warehouse to cost $750,000. New Kanawha Power Company, a subsidiary of the Union Carbide & Carbon Company, New York, is perfecting plans for a hydro-electric power development on the New River, W. Va., with initial capacity of 100,000 hp. Curtiss Flying Service, Inc., New York, will build a plant at Los Angeles, Calif., to cost more than $1,500,000. The Pennsylvania Bus Terminal Corporation, New York, plans a terminal building to cost about $500,000. Ford Motor Company, Highland Park, Detroit, Mich., has completed plans for an assembling plant at Edgewater, N. J., to cost $1,500,000. United States Rubber Company, New York, has asked bids for a multi-story plant at Passaic, N. J., to cost $1,000,000. Purchasing Agent of Essex County, Newark, N. J., will receive bids until Nov. 8, for electrical equipment, wiring, etc., at the Essex County Penitentiary. Charles J. Webb & Company, Philadelphia, Pa., will build a textile mill to cost $130,000. The Keystone Aircraft Corporation, Bristol, Pa., a subsidiary of the Curtiss-Wright Corporation, New York, plans extensions and improvements in plant to cost more than $150,000. State Department of Highways, Harrisburg, Pa., plans a laboratory to cost $120,000. Sun Oil Company, Philadelphia, Pa., is reported planning extensions in refining, storage and distributing plant at Marcus Hook, Pa., to cost $1,000,000. Clifford B. Connelly Trade School, Pittsburgh, Pa., will receive bids until Nov. 6, for equipment. General Purchasing Officer Panama Canal, Washington, D. C., will receive bids until Nov. 11, for wire and cable, electric water heaters, receptacles, electrical supplies, etc. (Panama Circular 2503). Bureau of Supplies and Accounts, Navy Department, Washington, will receive bids until Nov. 5, for lamp sockets for eastern and western yards (Schedule 2003); at the same time, for electric heaters for the navy yard at Charleston, S. C. (Schedule 2024). The Bureau of Yards and Docks, Navy Department, Washington, will receive bids until Nov. 13, for three electric-operated hammerhead cranes (Specification 6038.)

New England

Electrical equipment sales are running in high volume in power and industrial fields. Important hydro-electric construction, transmission and distribution programs are being pushed hard to meet increasing load requirements. The industrial market for electric service is growing steadily.

Business is flourishing in apparatus. Two 27,000-kva. hydro-electric units, seven 9,333-kva. power transformers, nine high-tension circuit breakers and various switching equipment have been bought for a Maine company, a rotary condenser for New Hampshire and important steam plant equipment for the Baton Rouge, La., district through the latter's Boston consultants. The last-named award covers three 18,750-kva. turbo generating units designed for 3,600 r.p.m. and over a score of auxiliary steam turbine-driven outfits are also under active consideration for this job. Engineering studies are being made of high-pressure steam applications in connection with various central station betterment and expansion projects.

Power transformer sales are running far ahead of last year and more life is apparent in the distribution transformer market. Line material proposals are active and purchases of fiber conduit are vigorously sustained. Motor sales are well ahead of a year ago in this territory, one house averaging 12 per cent increase. In the main, such sales are widely scattered, but one order of $80,000 value in fractionals was booked a few days ago for application to gasoline-filling station apparatus. Rotary converters for power company distribution service are included among recent Boston sales. Wooden crossarms are picking up and recent sales of floodlighting units and interior wiring material for commercial and industrial buildings are encouraging. The Golden Jubilee celebration will unquestionably stimulate permanent floodlighting business. Airport lighting is developing rapidly in this territory and a number of propositions are under way for early closure. Construction projects follow:

New England Ice Company, Hartford, Conn., contemplates an ice-manufacturing plant at West Hartford, reported to cost close to $100,000. Atlantic Refining Company, Philadelphia, Pa., plans oil refining, storage and distributing plant at New Haven, Conn., to cost $450,000.

Activities of the Trade

Worthington Pump Makes Diesel Engines

That American engineers are capable of producing Diesel engines which are the equal of any in the world is evidenced by the fact that Carels Freres of Ghent, Belgium, recently completed the first engine under license from the Worthington Pump & Machinery Corporation. The engine, a four-cylinder, two-cycle, double-acting unit developing 4,000 b.hp. at 128 r.p.m., has cylinders 28 in. in diameter and a stroke of 40 in. It is similar to the engines that Worthington has furnished the Shipping Board and is to drive a large alternator in South America. A second engine of this design is now being built by Carles Freres for service in the same power station.

Tungsten and Molybdenum Producers Merge

The leading producers of tungsten and molybdenum products for the electrical equipment industry have consolidated. The Tungsten Electric Corporation has acquired the business and assets, including properties, patent rights, trade marks, etc., of the Callite Products Company, Inc.; Independent Contact Manufacturing Company, Inc.; International Wire Company, Inc., and Precision Metal Products Company. All of the plants of the subsidiary companies are situated in Union City, N. J.

The leading products of the subsidiary companies are tungsten alloy wire, molybdenum wire, platinum substitute wire, electric contact filaments, rods, sheets, oxide-coated radio wire, oxide-coated cathodes, carbonized plates, heater coils, electric furnaces, stainless steel tools, electric sign flashers and incandescent lamps.

C. A. Laise, formerly with the Westinghouse Electric & Manufacturing Company, is president.

Combustion Engineering Awarded Equipment Order

The Combustion Engineering Corporation, American subsidiary of International Combustion Engineering Corporation, New York, announces the receipt of award for the complete fuel-burning and pulverizing equipment for six 3,256-hp. boilers to be installed in the Ashtabula plant of the Cleveland Electric Illuminating Company.

In this new installation 195,360 sq.ft. of boiler heating surface will be fired by the Lopulco pulverized fuel systems and approximately 2,700,000 lb. of steam per hour will be generated by these units.

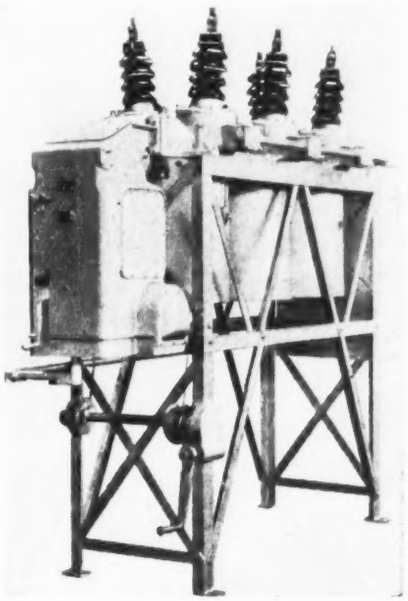
Crocker-Wheeler Electric Manufacturing Company has declared a $10 dividend on preferred, clearing up the accumulated dividends.

Electric Storage Battery Gives Stock Dividend.—A 100 per cent stock dividend and a distribution of surplus which equals $11 a share on a cash basis or which will give the stockholder an additional half share of stock in a new company to be formed as well as a warrant to subscribe to one additional share at $18 was announced by directors of the Electric Storage Battery Company last week. The new company to be formed will be called the Exide Securities Company.

New Equipment Available

125,000-Kva. Interrupting Capacity Breaker

Two additional sizes to its existing line of type JC oil circuit breakers have been announced by the Pacific Electric Manufacturing Corporation, 5815 Third



Street, San Francisco, Calif. Breakers of this type for voltages of 11,000 and 15,000 have been on the market for over a year, and to this line have now been added the JC-22 for 25 kv. and the JC-26 for 37 kv. operation. Each has an interrupting capacity of 125,000 kva., at either 25 kv. or 37 kv. The accompanying illustration shows one of the new JC-22 breakers.

Features of this type of oil circuit breaker are: One cast top member for all three phases with individual tanks per phase; all operating parts are fastened to the one-piece top member; factory assembly and adjustment; rotary type break, a principle used on the first successful 60-kv. breaker over 25 years ago; bakelite rotating unit carrying the contacts, which insures positive mechanical strength and wide safety factor in dielectric strength; ample oil capacity with high operating speed, giving these breakers greater interrupting capacity than other breakers of comparable size; motor or solenoid operation; end or side mounting of control with interchangeable mountings for either type of control.

The motor operators are of the compressed spring type, requiring very little energy for operation. Any good 24-volt storage battery will supply energy for the winding motor. This feature is valuable in remote locations where a direct-current control bus is not available. The JC-17 breaker takes a MS-2 operator and the JC-22 and JC-26 breakers the MR-1 operator.

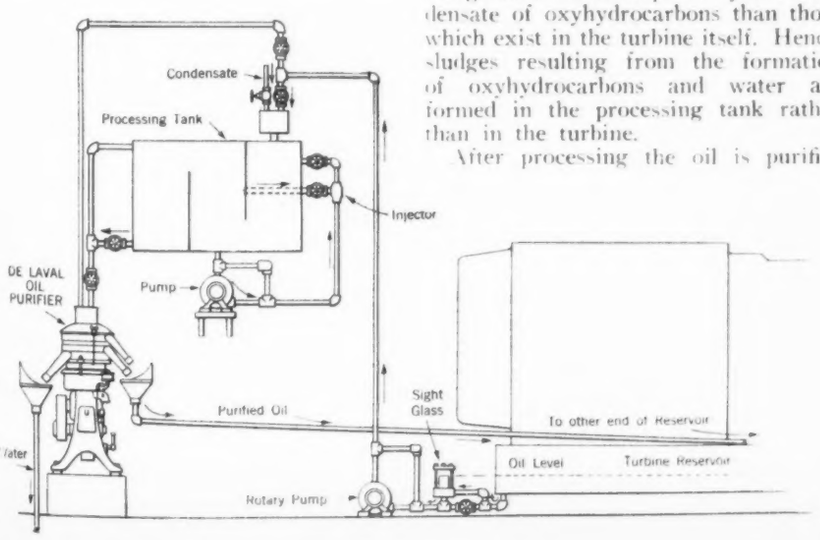
Process for Maintaining Efficiency of Turbine Oils

A new process for maintaining the efficiency of turbine lubricating oil is announced by the De Laval Separator Company, New York City. It is known as the De Laval-Funk process and its operation is based on the fact, now quite generally accepted by leading lubrication engineers, that sludge is the real troublemaker in turbine lubrication and that the formation of this product is greatly accelerated by the presence in the oil of water and oxyhydrocarbons, commonly referred to as acidity.

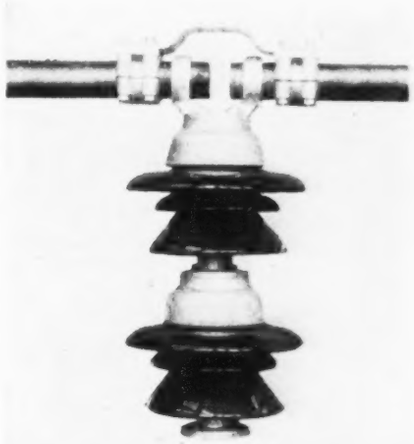
This new process is said to prevent the formation of sludge within the turbine lubricating system by a process in which a portion of the oil in circulation is continuously brought into contact with condensate under conditions more favorable to the formation of sludge and the absorption by the condensate of oxyhydrocarbons than those which exist in the turbine itself. Hence, sludges resulting from the formation of oxyhydrocarbons and water are formed in the processing tank rather than in the turbine.

After processing the oil is purified and separated from the sludge and condensate and other impurities by means of a De Laval oil purifier, from which it is returned to the lubricating system.

The quantity of sludge formed in the processing tank is said to be less than is produced by ordinary turbine operation, since the oxyhydrocarbons, or acids, are absorbed by the condensate before they have had an opportunity to act upon the oil. It is claimed that the process will operate almost equally well with various brands of turbine oil. Its installation is simple and may be arranged in almost any manner convenient to the plant. The equipment requires very little space—the processing tank being about 2 ft. square—and the consumption of condensate is so low as to be a negligible consideration, according to the manufacturer.



Expansion Joint for Aluminum Tube Bus



A new form of expansion joint especially adapted for long sections of heavy aluminum tube bus is announced by the Delta-Star Electric Company, Chicago.

To the cap of the standard insulator is bolted an aluminum alloy saddle with two projections, the interior surfaces of which are cone shaped. The tubular bus resting on these rounded surfaces is free to move and there is no binding due to conductor sags.

To each section of the bus is clamped a sheaf of thin flexible aluminum strips which permit moving of the tubes as they expand or contract. All the bolts and nuts are made of duralumin.

This new form of expansion joint is simple in construction and is easily attached by means of ordinary wrenches.

A Wrench for Installing One Point Brackets is announced by the Line Material Company of South Milwaukee, Wis. It is of simple construction and heavily galvanized. The wrench is inserted in the bracket eye with a spring latch to prevent it from slipping out of the bracket eye while in use, thus saving time and inconvenience.

Electrical Patents

Announced by U. S. Patent Office

(Issued October 1, 1929)

1,729,924. BENT SLIDING TROLLEY; J. Bozowich, San Francisco, Calif. App. filed July 13, 1927.

1,729,929. SWITCH; P. F. Denning, Cleveland Heights, O. App. filed June 27, 1927.

1,729,937. TOASTING APPARATUS; W. H. Ginder, Haddonfield, N. J. App. filed May 15, 1928.

1,729,939. RENEWABLE FUSE CONSTRUCTION; J. H. Hickey, San Francisco, Calif. App. filed Aug. 11, 1927.

1,729,949. ELECTRIC CONNECTER; J. Lofgren, Chicago, Ill. App. filed July 19, 1926.

1,729,962. THERMOSTAT ALARM SWITCH; J. A. Payzant, Schuyler, Neb. App. filed May 31, 1928.

1,729,971. COIL; L. J. Strait, Folsom City, Calif. App. filed May 9, 1925.

1,730,002. CAR POSITION INDICATOR SYSTEM; H. M. Friendly, Portland, Ore. App. filed Nov. 15, 1920.

1,730,010. VACUUM TUBE HOLDER; A. A. Kent, Ardmore, Pa. App. filed Nov. 15, 1926.

1,730,016. APPARATUS FOR STERILIZING LIQUIDS; H. B. Rudd, Mansfield, O. App. filed March 3, 1920.

1,730,027. AUTOMOBILE SIGNAL; G. Alexander, Hamilton, Ont., Can. App. filed May 10, 1924.

1,730,031. FIXTURE SUPPORT; H. D'Olier, Jr., Bridgeport, Conn. App. filed Jan. 11, 1928.

1,730,042. ELECTRIC HEATER; A. B. Pendleton, Greenwich, Conn. App. filed Aug. 2, 1928.

1,730,043. ELECTRIC PULL SWITCH AND SOCKET; F. Rosner, Brooklyn, N. Y. App. filed May 23, 1927.

1,730,050. ELECTRIC METAL WORKING MACHINE; A. L. Bausman, Springfield, Mass. App. filed Nov. 4, 1925.

1,730,080. CLOUD OR FOG SOUNDING DEVICE; G. P. Luckey, Dayton, O. App. filed April 11, 1923.

1,730,098. ELECTRIC TRAFFIC SIGNAL; L. M. Tartaglia, Albuquerque, N. Mex. App. filed June 22, 1925.

1,730,102. INSULATOR; N. A. Wahlberg, Wilkinsburg, Pa. App. filed April 11, 1927.

1,730,103. ELECTRIC FURNACE; J. Weintz, Cleveland, O. App. filed April 26, 1926.

1,730,104. ELECTRICAL EXTENSION CONDUCTOR AND REEL; W. G. Wheat, Kansas City, Mo. App. filed Oct. 16, 1928.

1,730,112. DISTILLATION APPARATUS; A. E. Becker, Newark, and J. R. Schonberg, Westfield, N. J. App. filed Jan. 9, 1924.

1,730,124. INSULATOR; F. Conrad, Pittsburgh, Pa. App. filed July 7, 1920.

1,730,136. INSULATING BUSHING; A. Haller, Baden, Switzerland. App. filed Feb. 27, 1926.

1,730,169. HIGH-POTENTIAL INSULATOR STRUCTURE; H. B. Smith, Worcester, Mass. App. filed Dec. 11, 1922.

1,730,170. INSULATOR; H. B. Smith, Worcester, Mass. App. filed July 13, 1923.

1,730,171. INSULATOR; H. B. Smith, Worcester, Mass. App. filed July 28, 1923.

1,730,180. INSULATOR; N. A. Wahlberg, Wilkinsburg, Pa. App. filed May 11, 1927.

1,730,203. ELECTRIC HEATER; W. W. Guest, Chicago, Ill. App. filed Sept. 10, 1926.

1,730,216. RELAY; A. B. Kendall, Maywood, Ill. App. filed March 1, 1926.

1,730,218. SYNCHRONOUS MOTOR AND METHOD AND MEANS FOR OPERATING SAME; J. K. Kostko, University City, Mo. App. filed Nov. 5, 1928.

1,730,232. INSULATOR STRUCTURE; E. B. Newill, Wilkinsburg, Pa. App. filed April 28, 1927.

1,730,233. ELECTRIC SWITCH; H. E. Norviel, Anderson, Ind. App. filed Feb. 13, 1924.

1,730,237. BREATHER COVER FOR FUEL TANKS; J. S. Patten, Madison, N. J. App. filed Oct. 3, 1925.

1,730,240. VARIABLE REACTIVE COUPLING WINDING; R. S. Piper, Chicago, Ill. App. filed July 31, 1926.

1,730,250. INSULATOR; H. B. Smith, Worcester, Mass. App. filed April 1, 1922.

1,730,254. CONTROL SYSTEM; P. Thomas, Edgewood, Pa. App. filed May 3, 1928.

1,730,276. ALARM MECHANISM FOR CLOCKS; A. J. Kollman, New York, N. Y. App. filed May 1, 1926.

1,730,283. CONTROL SYSTEM; P. McShane, Pittsburgh, Pa. App. filed Sept. 19, 1927.

1,730,308. TEMPERATURE INDICATING MEANS; C. B. Thwing, Philadelphia, Pa. App. filed Sept. 3, 1925.

1,730,311. NARROW-TYPE PANEL MAIN SWITCH; H. G. Baxter, Baldwin, and H. K. Krantz, Rockville Center, N. Y. App. filed June 8, 1927.

1,730,316. COLOR LIGHT SIGNAL; P. D. Brown, New Haven, Conn. App. filed March 15, 1926.

1,730,327. INSULATOR; W. H. Kempton, Forest Hills, Pa. App. filed June 28, 1918.

1,730,335. SIGNAL; E. C. Rumsey, Detroit, Mich. App. filed March 12, 1927.

1,730,340. POWER GENERATING SYSTEM; G. F. Smith, Wilkinsburg, Pa. App. filed July 6, 1926.

1,730,341. SYNCHRONIZING RELAY SYSTEM; P. Thomas, Edgewood, Pa. App. filed Aug. 25, 1927.

(Issued October 8, 1929)

1,730,344. SHOCK-ABSORBING SOCKET FOR VACUUM TUBES; R. B. Benjamin, Chicago, Ill. App. filed Nov. 23, 1925.

1,730,349. ELECTRODEPOSITION OF CHROMIUM; R. Auerbach, Probstdeuben, near Leipzig, Germany. App. filed June 22, 1927.

1,730,366. ELECTRIC HEATING SYSTEM FOR STREET CARS AND THE LIKE; W. G. Hartwig, Chicago, Ill. App. filed Dec. 10, 1923.

1,730,368. METHOD OF AND MEANS FOR MEASURING DIFFERENCES IN TIME OF PROPAGATION OF WAVE FRONTS OF DIFFERENT FREQUENCIES OVER A CIRCUIT; J. Herman, Westfield, N. J. App. filed Dec. 2, 1927.

1,730,373. BATH CABINET; R. J. Kideney, Buffalo, N. Y. App. filed Oct. 9, 1926.

1,730,396. AUTOMOBILE LOCK; E. J. Van Sickel, Chicago, Ill. App. filed Aug. 4, 1926.

1,730,397. ELECTRODE HOLDER FOR ELECTRIC-ARC WELDERS; C. Waglie, Baltimore, Md. App. filed June 29, 1927.

1,730,402. TESTING APPARATUS FOR ELECTRICAL CIRCUITS; H. H. Abbott, New York, N. Y.; and G. W. Kuhn, Glen Rock, N. J. App. filed March 28, 1928.

1,730,406. SUPPORTING DEVICE FOR TROLLEY WIRES AND OTHER CONDUCTORS; H. P. Chandler, Mansfield, O. App. filed Feb. 17, 1928.

1,730,411. FILTER; H. G. Dorsey, Gloucester, Mass. App. filed Nov. 11, 1922.

1,730,426. SWITCH MECHANISM; O. S. Hershey, Chicago, Ill. App. filed Oct. 27, 1926.

1,730,443. METHOD OF UNITING METALS; N. H. Adams, Schenectady, N. Y. App. filed Oct. 5, 1922.

1,730,447. RECTIFIER FOR ALTERNATING CURRENTS; J. H. Bruninga, St. Louis, Mo. App. filed March 30, 1922.

1,730,499. RHEOSTAT; H. H. Frost, Chicago, Ill. App. filed Dec. 5, 1924.

1,730,504. SYNCHRONIZING CLOCK SYSTEM; L. S. Harrison, New York, N. Y. App. filed Nov. 29, 1924.

1,730,505. PHOTO-ELECTRIC CELL; R. Hart, Santa Monica, Calif. App. filed Jan. 30, 1928.

1,730,527. STOPLIGHT AND REAR ILLUMINATION FOR AUTOMOBILES; G. F. Robbins, Portland, Ore. App. filed Jan. 10, 1925.

1,730,554. ATTACHMENT PLUG CAP; A. J. Blake, Bridgeport, Conn. App. filed May 5, 1928.

1,730,599. QUICK-OPENING SWITCH; W. A. Wulle, Chicago, Ill. App. filed Dec. 17, 1926.

1,730,600. COMBINATION ELECTRIC WALL FITTING; T. A. Both, Stratford, Conn. App. filed Sept. 8, 1925.

1,730,643. REFILLABLE FUSE; R. C. Butler, Mount Vernon, O. App. filed June 26, 1926.

1,730,661. RENEWABLE SAFETY FUSE; H. Klasen, Cologne-Worringen, Germany. App. filed March 19, 1927.

1,730,674. DEVICE ON WINDING MECHANISM; J. Mettler, Zug, Switzerland. App. filed Feb. 25, 1922.

1,730,683. SIGNALING BOX; F. B. Philbrick, Needham, and F. A. Raymond, Newton Center, Mass. App. filed Sept. 16, 1927.

1,730,688. MAGNETIC SWITCH; C. H. Rippl, East Cleveland, O. App. filed July 14, 1927.

1,730,693. LIGHTING FIXTURE; H. Shardlow. App. filed Jan. 18, 1927.

1,730,715. CONDUCTOR TERMINAL FOR BUSHINGS; A. O. Austin, Barberton, O. App. filed July 29, 1922.

1,730,716. HIGH POTENTIAL FUSE; A. O. Austin, Barberton, O. App. filed May 25, 1925.

1,730,725. POLARIZING ELECTROLYTE; P. E. Edelman, Chicago, Ill. App. filed March 19, 1928.

1,730,730. MAGNETIC CHUCK; H. Humphreys, Oldham, England. App. filed Oct. 17, 1927.

New Trade Literature

CLAMPS.—Bulletin No. 236 has just been issued by the Diamond Expansion Bolt Company, Garwood, N. J., describing the new diamond twist clamp. This four-page booklet describes with text and illustrations a new method of attaching conduit to walls and ceilings.

CABLES.—A six-page folder describing a unique cable installation has recently been issued by the American Steel & Wire Company, Chicago. The installation was made for the Tennessee Coal, Iron & Railroad Company, Birmingham, Ala. This folder gives the salient features of the installation and contains illustrations giving an idea of some of the stages of construction and installation.

LATHES.—The South Bend Lathe Works, South Bend, Ind., has just issued two fully illustrated two-color bulletins describing their new model 9-in. regular and 9-in. junior lathes. Both are back-geared screw-cutting machines and are available with any desired combination of several kinds of drive, types of legs, lengths of bed and other features. The bulletins contain complete specifications and prices of each of the many possible arrangements. Bulletin No. 9 covers the new model South Bend 9-in. lathe, one section being devoted to construction, manufacture and inspection, and another to some of its varied uses. Practical attachments for adapting it to milling, keyway cutting and grinding are also described and priced. Bulletin No. 22 covers the new model South Bend 9-in. junior lathe, which is of the same quality as the other machine, but designed particularly for use in the small shop and sold at a popular price. Both bulletins contain information on use of the lathes for tool room and manufacturing purposes.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

Agency and purchase are sought in Cochamba, Bolivia (No. 41,335), for flashlight batteries.

Agency and purchase are sought in Buenos Aires, Argentina (No. 41,368), for storage batteries and parts for automobiles.

Agency or purchase is sought in Copenhagen, Denmark (No. 41,413), for battery and dry cell manufacturing articles.

Purchase is sought in Malaunay, France (No. 41,403), of electrical ice cream cabinets.

Agency is sought in Tallinn, Estonia (No. 41,379), for electric drills.

Agency is sought in Buenos Aires, Argentina (No. 41,438), for flashlights and batteries.

Agency and purchase are sought in Brussels, Belgium (No. 41,409), for electric hair driers and permanent wave machines.

Agency is sought in Berlin, Germany (No. 41,337), for electrical household appliances.

Agency is sought in Hamburg, Germany (No. 41,317), for electrical household appliances, including refrigerators and washing machines.

Agency is sought in Hamburg, Germany (No. 41,408), for electric household and restaurant appliances.

Purchase is sought in Vancouver, Canada (No. 41,417), of table and floor lamp stands.

Agency is sought in Florence, Italy (No. 41,352), for electrical paint sprayers.

Agency is sought in Florence, Italy (No. 41,352), for electrical refrigerators.

Purchase is sought in Malanuay, France (No. 41,403), of electric refrigerators.

Agency is sought in Cardiff, Wales (No. 41,404), for electrical refrigerators for households and retail provision stores.

Agency is sought in Seville, Spain (No. 41,369), for electrical household refrigerators.

Agency or purchase is sought in Buenos Aires, Argentina (No. 41,411), for electric household refrigerators and washing machines.

Agency is sought in Cairo, Egypt (No. 41,406), for wires and cables.